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The ELECTRICAL REVIEW

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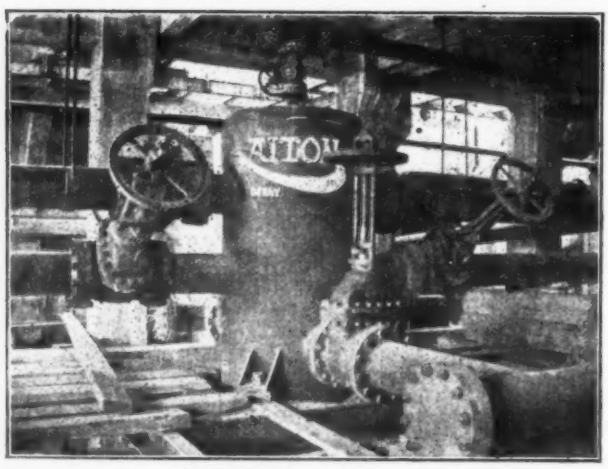

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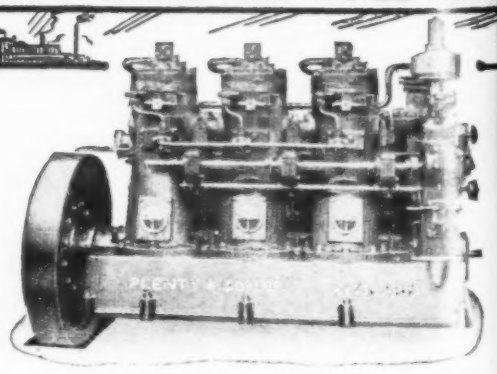

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Electrical Manufacturing Activity.

THOSE who have reason for remembering the days when the British electrical industry was full of trouble and when it was exceedingly difficult to raise capital for new operations should find it good to be alive to-day.

There is abundance of work in hand, much more in immediate prospect as normal electrical development proceeds, and still a great deal more approaching as the purchasing power of other countries further improves, accelerating the pace of the electrification of the world in general. Instead of electrical securities being in disfavour, they are in great demand, and issues are over-subscribed—unfortunately, as is usual under such circumstances, rendering it necessary to give warnings regarding undesirables.

It was felt that we had, under war and other boom conditions, extended works until it seemed that production facilities were greatly in excess of prospective demand; indeed, over-production was the cause of American depression. It is obvious that there is no fear of danger of excessive works capacity present to the minds of a number of leading electrical manufacturing companies which have lately issued their annual reports. Quite the reverse of that state of things actually exists in certain cases, necessitating the carrying-out of further extensions.

Callender's Cable Company has incurred considerable expenditure upon enlarging its facilities for the manufacture of super-pressure mains for which 1924 brought a heavy demand, while many important contracts are to follow. Not only is there this comparatively new class of business in prospect, but the demand for mains for all purposes shows no falling off and the overseas business is being generally extended. The rapid expansion has made it necessary to increase the capital resources. The company experienced a most gratifying increase (£57,622) in net revenue, but it is not distributing this sum, the directors choosing the wise policy under the present conditions, of carrying it forward. The decision to manufacture cables in America in conjunction with the Okonite Company is typical of the company's courageous readiness to take advantage of opportunities arising in other producing countries.

Another company which records marked improvement in business in 1924 is Siemens Bros. & Co., Ltd. It is stated that orders flowed in freely, output was steadily

increased, and the turnover and profits were substantially in excess of those of the previous year. Here, again, new capital was required, for although the works had been but recently extended, further additions have become necessary. The need has arisen through "the influx of orders and the growing use of electricity" with the "consequent prospect of a larger volume of business in electrical plant for a considerable time to come." A comprehensive scheme of buildings and plant extension at Woolwich has therefore been put in hand, and a quarter of a million 10 per cent. preference shares have been sold to provide for the capital expenditure which will be spread over the next twelve months.

A third important manufacturing extension reported is that of the British Thomson-Houston Co., Ltd. This company during 1924 expended £343,189 upon additions to buildings and machinery, chiefly at the Willesden works. Last year the directors stated that it was their policy, as the business expanded, to meet the demands made upon it by acquiring additional factories and equipment as rapidly as possible. The profit for 1924 was £514,980, compared with £451,778 in 1923, indicating large expansion in business justifying an increase in works extension expenditure from £227,000 in 1923 to £343,189 in 1924.

The English Electric Company's results have been already reported here. The chairman said that while they had no reason to be dissatisfied with the results of the year's operations, the general level of prices still left much to be desired. The chairman of the Brush Electrical Engineering Co., Ltd., was careful to point out that though a 10 per cent. (less tax) dividend was to be paid, the circumstances of the company were not quite so good as at first sight they might appear. True it was that in respect of internal organisation, quality of product, economy and efficiency of production all was well, but there were difficulties and dangers from without, and if they attempted to secure a higher rate of profit such action would militate against their securing orders. He was lukewarm in his attitude toward a proposal for an interim dividend, as in a business which was subject to political and other circumstances it was not always possible to see in advance what the profits of the year would be.

Some other industrial results which have been recorded may be mentioned again as contributing to the story of the general trend of things. The Metropolitan-Vickers Company showed an improvement in orders received and shipped during 1924 as compared with 1923, but "prices remained at a low level owing to continued competition" and to the depressed condition of trade generally. There was a record output; orders received were better in value by 30 per cent., and those completed by 21 per cent., than in 1923. The British Insulated & Helsby Cables, Ltd., reported an increased profit due to increased turnover rather than a higher rate of profit. The works were engaged to their fullest capacity; the turnover was the largest in the history of the company; and works extensions to cost £250,000 had to be taken in hand, the new plant being due to be brought into operation this summer. The British Electric Transformer Manufacturing Co. ended the year 1924 with orders of 50 per cent. greater value than that of those on the books at the end of 1923.

London Electric Wire Co. & Smiths, Ltd., largely increased its turnover, but experience proves that owing to the narrow margin of profit now secured, turnover must be large in order that business may be remunerative. Reyrolle & Co., Ltd., spent £91,837 upon capital account in 1924, considerably increasing the output by means of new machine shops. The Lancashire Dynamo & Motor Co. reported better results and more orders in hand than in the preceding year.

And so no doubt the story would continue if we were allowed access to the profit records of the hundreds of concerns connected with the electrical manufacturing industry whose results are not discussed in public meeting.

We have brought the foregoing facts and statements together merely to give a connected summary, not to encourage complacency. We have not repeated the words with which directors have indicated the difficulties that confront producing companies, for these have been so often reviewed here. Companies which are launching out upon works extensions hardly show signs of folded hands or complacency, and no directors can hold office long in electrical companies without being both impressed with the difficulties of the times and encouraged by the certainty of ceaseless electrical progress. If everybody electrical would reasonably boost everything electrical the demand for all classes of our products should increase far beyond all previous records, calling for a policy of continuous works extension on the part of the manufacturers.

Engineering Industry.

The deputation which waited upon the Premier recently to urge upon him the desirability of facilitating engineering and other public works, including railway electrification, laid before him the plight of the skilled worker. Bearing in mind the distressed state of the general engineering industry, and the increasing strength of foreign competition therein, as other countries are set upon their feet by means of British diplomacy and American finance, it is to be hoped that some practical measures will be forthcoming for setting the wheels of engineering industry revolving at higher speed than of late. Railway electrification, hydro-electric and other such contracts for undertakings here and in other parts of the Empire would bring returning activity to some of our general engineering works, and they would also help electrical manufactories to maintain their position. According to the official reports of the interview with the Premier, Mr. Baldwin expressed the intention of the Government to lose no opportunity of forwarding any practicable plan that seemed likely to alleviate unemployment in the engineering trade.

In our leading article last week we reviewed a number of the problems connected with the standardisation of production in the iron and steel and coal industries. Faced with these problems as we are, it is certainly gratifying to feel that we have at the head of our Government a man with experience in the practice and direction of one of those basic industries, and a man who has a keen appreciation of what should be done and who has an earnest desire and the will to use his position not only for the good of our Empire as a whole, but particularly for the improvement of the conditions of the working classes who are so dependent on the prosperity of industry.

Mr. Baldwin, in his speech at Oxford, said: "There are few things I have given more interested attention than I have endeavoured to outline"—and these principles were: "That the right way towards social prosperity and reorganisation of this country lay through the scientific organisation of our productive power" and not by the "lowering of wages and the standards of life."

Atmospheric Aerial Charges.

We are now in the season when it becomes a frequent occurrence for aerials, particularly those in exposed positions, to receive charges of electricity from the atmosphere in one of several ways: the aerial may have induced in it a high potential by the ordinary discharge of static electricity, or it may receive the charge from rain, hail, or mist; in either case the charge in the aerial may quickly reach a potential at which it will break down the air gap between the plates of an ordinary tuning condenser, if a condenser be located in the path of the aerial to earth, or it may even spark across the contact points of an earthing switch if this is left open.

During the summer months the meteorological conditions which may produce this heavy aerial charge may

be confined to quite a small area. Frequently they will occur in the early evening, when the heat of the day has left the air somewhat humid. A passing cloud carrying an accumulation of electricity not heavy enough to discharge in the ordinary form of lightning may discharge through drops of rain or hail. During the shower, every drop which strikes the aerial will transfer its charge to the wire, and these infinitesimal charges will build up a potential sometimes of quite a high voltage. Similarly, though much less frequently, the lower layers of air, when charged with electricity, may discharge through the globules of moisture in a mist settling upon the aerial.

All these circumstances are distinct, of course, from the direct striking of an aerial by lightning, which fortunately very rarely happens, but the charge transferred in any of the ways indicated is often strong enough to necessitate care in leaving the aerial with a closed path to earth when the set is not in use, and in seeing that flimsy, easily inflammable curtains are not left touching the lead-in, the earthing switch, or the aerial tuning condenser.

A Continental Electrical Union.

An interesting announcement appears in a French newspaper from which we learn that there has recently been constituted an international union of producers and distributors of electrical energy, the professional associations of Belgium, France and Italy being parties to the arrangement. The union, which aims at the study of all questions appertaining to production and distribution, will collect documentary evidence respecting the legislation and regulation of the distribution of energy in different countries, as well as statistical information regarding the various undertakings. A committee has been set up. Correspondence with other countries in Europe and America with a view to their also becoming members of the union is proceeding. It is suggested that the new union will fill a rôle similar to that of the International Railway Union and the International Union of Tramways. M. Georges Marty, secretary of the Syndicat Professionnel des Producteurs et Distributeurs d'Energie Electrique, is acting as secretary to the committee.

The Swiss Market.

To suggest Switzerland as a market for British electrical goods while several reputable Swiss firms are making bold bids for our internal electrical business may not seem particularly helpful, but it is evident from the report of Mr. Sperling, which we review in this issue, that there are opportunities in the Federation for British manufacturers.

Switzerland has a very favourable balance so far as dynamo-electric machinery is concerned: her exports in 1924 totalled 6,223 tons, while her imports were only 585 tons, yet of the latter quantity Great Britain supplied 158 tons, as compared with 51 tons in 1923. It is in the lighter classes of electrical goods, however, that opportunities seem to be open to Great Britain. The radio apparatus market has experienced a phenomenal growth, and British manufactures are in favour where they are known, although their prices are considered high. Mr. Sperling also mentions specifically accumulators and telegraph and telephone apparatus as possible lines of business for British firms. The report shows that telephony is developing very rapidly in Switzerland, while telegraphy is being gradually superseded.

Turning to another aspect of the subject of foreign trade, it would appear that Swiss manufacturers are in much the same position as British producers. The competition of countries with low exchanges and inferior working conditions is being felt, and every effort is being made to improve methods, cut wage costs, and obtain a better output from the workers. A report on Sweden with which we dealt recently disclosed a similar state of affairs in that country, so that we have the doubtful comfort of knowing that the depression in our engineering industry is not peculiarly British.

Electricity Supply Progress.

THIS month, within a space of eight days, three new installations have been formally opened—the reconstructed station at Bow, of the Charing Cross Co., the new "superstation" of the County of London Co. at Barking, and the new station of the Hastings Corporation at Broomgrove. Every one of these is of exceptional interest; they are typical of up-to-date practice in three classes of undertaking—the bulk supply station of 100,000 kW upwards, the station of 50,000 kW, and the station of 10,000-20,000 kW capacity—and the existence of each class is justified by circumstances. Anyone who imagines that a new era is at hand in which all generating stations will be of the "super" type is doomed to disillusionment. The fact is that if in any undertaking of reasonable size and modern design, coal were obtainable gratis, the price of electricity to the consumer could not be reduced by more than a halfpenny per kWh; the larger the station the less would be the gain per kWh. No superstation has a free coal supply, and though, of course, the generating costs are lower in a large station, the saving thus effected is largely offset by the greater cost of transmission. Hence we would caution our readers against undue optimism with regard to the cheapening of electricity supply as the result of changes in power-station practice.

Capital charges and other fixed costs continue to form the greater part of the total cost of supply, and there is only one effective way of relieving the pressure from this source—that is, by improving the load factor.

It is strange that, whilst there are frequent references to this fact, so little is really done to improve the conditions. So long as load factors remain in the neighbourhood of 25 per cent., cheap electricity is unattainable. The raising of the load factor to 50 per cent. would halve the capital charges per kWh, besides reducing the running costs; hence the addition of off-peak loads is a matter of first importance to every supply manager.

It is here that the Electrical Development Association can score so heavily if it is given the opportunity. It has been stated by those who know, that the consequences of an energetic campaign for the development of the domestic load are extraordinary and immediate; the resulting load does not add materially to the peak demand, therefore it must improve the load factor and cheapen the cost of supply. If E.D.A. were provided with adequate funds it could render invaluable assistance in this direction and produce results more economically than unaided local effort. We hope that its hands will be strengthened by the financial support of every undertaking in the country, but we also hope that every effort will be made by station managers to find, invent, or otherwise obtain additional off-peak loads for themselves, and one good method of doing this is to offer a rational scale of charges—flat rates do no good to the load factor.

The debate in the House of Commons on Thursday last week, from which so much was expected, added little of interest to existing knowledge; Lieut.-Col. Ashley had not even had time to examine the report of Lord Weir's Committee, and could only reiterate that the policy of the Government was to provide a cheap and plentiful supply of electricity throughout the country. Mr. Lloyd George took him to task on this point, citing the progress of foreign countries and eloquently deploring the delay at home, and Mr. Snowden followed on similar lines. The latter elicited one interesting item of news—namely, that the preliminary investigation of the Severn barrage scheme confirmed the opinion of Sir John Snell, who had said that the scheme ought to go on; Col. Ashley expressed the hope that eventually a continuous output of 200,000 kilowatts would be obtained from this source. With regard to the standardisation of frequency he would not commit himself, deferring any statement until the policy of the Government could be set forth as a whole.

E

Electric Cables for High Pressures.

A Review of the Present Position.

By E. BERRY NIXON, A.M.I.E.E.

One cannot help but realise that considerable changes have, perhaps of necessity, taken place in the cable industry. Possibly these have been greater in a direction least realised—philanthropy! No doubt the statement is a weird one, but it is intended to apply to one of the milestones of progress where a stage of design is considered; design is an overworked word, and we could conveniently substitute "idea."

Philanthropy commences at home, so we are advised; unfortunately when home is the office this is not admissible, we are far from being philanthropists, our inclination is to be too conservative in our ideas, with the possible exception of those of us who fill the journals. Were it not that personal competition keeps us alive, and fosters to a certain extent individualism, we would, in our horror of contradiction and derision, remain silent.

There are too few good men to-day who are willing to subject their ideas to publicity, and a comparison with the ancients yields the necessary proof. This is not a suggestion that we should all put our views in writing—we do not want fiction, but intelligent co-operation. After all, what results have we to show for our conservative policy—are satisfactory 33-, 66-, and 110-kV underground mains woven through the countryside?—emphatically No! These words may or may not be opportune, but there is now a definite movement against cast-iron principles. At last we are beginning to realise that the list of failures should not be added to, rather is it preferable to change the order of things, and cut out the tin bath principle—if you wish to hold another pint, make the bath larger.

Sapere aude—let us consider cable components.

The Core.

Without descending to personalities, it is correct to say that the opinions of the responsible people are as unlike as the poles on this important detail. Both cannot be correct; does this alone not condemn individuality in action? Obviously a core size is governed by the voltage stress at its surface, irrespective of the current values below 100, 60, and 40 amperes for the higher voltage steps; but *is* this obvious?

The Dielectric.

The scope in this direction is bewildering, but apparently we are content with the findings of our ancestors, disastrous as the choice has proved to be. I have advocated graded dielectrics as a solution of the trouble for some time, and strange as the suggestion appears, we shall be compelled ultimately to fall back on this method to produce satisfactory high-pressure cables. They need not be dearer than the present paper cables, and will not be so bulky. If we continue with paper, what will be the ultimate diameter of a 110-kV cable if the stress at the core is kept at 40 kV per cm.? Impossible, you will admit.

The inclusion of voltage curves for graded and paper dielectrics would give the solution to this problem, but as this ground has previously been covered, it does not appear necessary to traverse it again.

The difficulties of impregnation are manifold. True, there is one cable which I have previously mentioned in this journal, Messrs. Henley's S.L. cable: this overcomes the difficulties of three-core impregnation, but can we attain in super-pressure cables the unchangeability of the dielectric which can only be attained by free and continuous impregnation? The Brooks and Johnson and Phillips oil systems, although without the present-day polish, give an indication of what is required, but of course in a different manner.

In making a study of cable failures one is struck by their dissimilarity. It is not etiquette to make actual references, but it is apparent in some that to a large or small degree the paper was suffering from a lack of impregnating media between layers. These points are equally apparent to the responsible parties, and we can leave it to them to administer justice.

It is illuminating to discuss these problems with a switchgear designer. Generally the first observation contains a note of wonder that the cable will work at that voltage; at the first question we fail—what is the safety factor?

Necessary as they may appear, the respective safety factors of cable and switchgear, even though they be connected, cannot be compared. I have previously written in the journals on this point, but unfortunately the position is still *sicut ante*. In the case of switchgear, but not that of cables, the safety factor can be guaranteed, it is the basis of the design; how pleasing it would be were the two uniform! The definition of safety factor of cables is a difficult problem. At present it is decided by dividing the 15-minute test voltage by the working pressure to earth; this is a fallacy and does not represent the true factor of safety. Upon the behaviour of the dielectric at the core falls the decision of this factor; it becomes automatically higher with the use of a component having a high dielectric coefficient, and it obviates the necessity of piling on the insulation, where paper is used, to achieve the same results. The advocating of component dielectrics does not represent a claim to new ideas; at least 35 years ago there were valuable observations made on this theory, and they are represented, not necessarily by the same people, in the Jona graded cable.

The true factor can only be truly proved by the test voltage for at least one hour, considered against the working voltage; these tests should not become a routine, rather is it preferable to conduct them on "test lengths"; it is generally being realised that works tests of any high pressure do not assist in the least degree. There is absolutely nothing to prevent a cable breaking down on normal voltage immediately after it has withstood its laying test. It is possible that irregularities in the dielectric which would not give trouble under normal conditions are aggravated by these tests: the policy of this is not apparent. The fundamental design is proved on the "test lengths," and data derived from these tests should be the standard for that particular class of cable: the completed lengths could be tested at their working voltage for a sufficient length of time to prove their efficiency. The hope is expressed that the solution of all high-pressure cable troubles has been found, but in any event these few observations may be beneficial.

In conclusion, it is not thought that this article marks an epoch in cable history; rather is it an invitation to more able men to express their views.

A Two-million-Volt Testing Outfit.—So that it may endeavour to solve the problems of high-voltage transmission well in advance of actual requirements, the Leland Stanford University, of Palo Alto, Cal., U.S.A., recently ordered a 2,000,000-V testing outfit from the General Electric Co., of Schenectady, N.Y. The set will, it is claimed, operate at the highest voltage ever produced at commercial frequency, that is, at 60 cycles. The voltage will jump a spark gap formed by two needles spaced about 17 ft. apart. Prof. Harris J. Ryan, past president of the American Institute of Electrical Engineers and an authority on high-pressure phenomena, will in future devote his entire time to research activities in high-voltage work. The new apparatus will be located in a special laboratory, and there will be a large plot of ground for the construction of an experimental transmission line.

The "Repairs" Organisation—II.

Routine for Handling Repairs.

By W. J. HISCOX.

WHILST repairs rendered necessary by defects and neglect are handled by the district mechanic (except where it is desirable for an investigation to be made in the factory), those occasioned by legitimate wear and tear are sent to the factory for execution. The reason is that these repairs are usually more involved, and require those facilities that are not always at the disposal of the outside mechanic.

The return of the unit to the factory is arranged by the district salesman, at the request (or with the concurrence) of the customer. It is assumed that, at the instigation of the salesman, the unit has been inspected by the mechanic, and a report compiled. It is this report that determines the destination of the unit, and the salesman must therefore be acquainted with the facilities offered by the repairs section attached to the depôt.

The district mechanic is not kept for the purpose of executing wear and tear repairs, his time being fully taken up in installing new purchases, effecting running repairs, and overhauling and reporting upon the older units. It is only in exceptional circumstances, therefore, that these repairs are handled in the district depôt, and apart from this, it is apparent that a preliminary inspection (such as that conducted by the district mechanic) cannot always give the precise nature of the repairs to be effected.

The mechanic's report enables the salesman to acquaint the customer with certain broad particulars, and of the advisability or otherwise of submitting the unit for repair. If the customer agrees, the unit is sent to the factory, where a thorough overhaul is instituted and an estimate submitted. It is not often that a unit is recalled by the purchaser because the estimate is too high, for the salesman is usually able to give him some idea of the probable cost. It may be that, despite the report, the customer will only sanction certain work to be done, and the report that comes from the factory in answer to this must be carefully worded.

To do the work specifically sanctioned, it may be that other work must also be done, in order to maintain the utility of the product. If this involves but little additional outlay, it may be included in the estimate without comment, but if, on the other hand, the additional expenditure is fairly high, the customer is informed. If he shows unwillingness to agree, it may be well to explain in detail the value of this extra work, for it is bad business if the repair, when executed in accordance with the customer's orders, shortens rather than prolongs the life of the unit.

On the other hand, it should be understood that the repair must not have the effect of presenting the customer with a practically new machine, when it is only for the purpose of giving him full value for money. There are many parts of the unit (and these the most expensive) which are practically everlasting, and a machine may be kept in commission for a lifetime, if at certain periods the comparatively few parts liable to wear are replaced. It is safe to say that there would be little new business were this to be permitted, and there must come a time when it is decided that the effective life of the machine is finished, and that further repairs cannot be undertaken.

Many firms undertake repairs only to prevent these getting into the hands of competitors, and so influence new business; whilst this no doubt is the first aim and object, the repairs section should be a paying branch itself. The getting of new business through the medium of repairs is a fascinating matter, but the charm is still more obvious if the repairs pay for themselves, and in addition yield a margin of profit. The repairs section of many concerns is very badly organised, and it cannot be seen that this is having an adverse effect upon new business; yet it should be apparent that an efficient repairs section is doubly productive, seeing that it pays for itself, and at the same time encourages new business.

If repair work is to be undertaken, it should be undertaken in a whole-hearted manner, otherwise it represents the weak link in the organisation. This part of the organisation can make or mar business, for it is here that the customer makes an appeal which, if disregarded, may have serious consequences. No repair work should be undertaken unless it is known in advance that the customer will be satisfied, and it is the business of the salesman to ensure this. If he knows his job—if he understands the commodity—if he can read his customer—his task is not really difficult, assuming, of course, that the repairs organisation is equally efficient.

There are many so-called repairs that can quite easily be handled by the purchaser himself, and he should be encouraged in this direction. On the other hand, there are many apparently simple things that the purchaser thinks he can do, but which really need the attentions of a qualified mechanic, and his bent in this direction should be discouraged. In other words, let him tinker about with the machine so long as he cannot injure the mechanism or impair its utility, for he will then take a personal pride in it, and his interest will be maintained. If he is warned off altogether, he will suspect an ulterior motive; a suggestion will be received with suspicion, and every estimate will be challenged.

No repair should be undertaken that can be handled by the purchaser without difficulty, for it will not pay. If the purchaser is chary about touching the machine, it is of course advisable to send a mechanic along, or it may be that the salesman himself could effect what is probably but a small adjustment. It is important that all parts for replacements be supplied by the firm, and this equally so when the part is to a common standard, such as a Whitworth bolt, &c. The customer should be impressed with the necessity of purchasing all replace parts from the makers of the machine, for in every district there are jobbing mechanics anxious for the opportunity for handling the machine. From supplying and fitting standard parts they turn to tackle the specialities, and either prolong indefinitely the life of the machine, or become responsible for an injury which the customer (aided by the suggestion of the delinquent) attributes to the makers.

All outside repairers should be kept away, and this is possible only when the customer is assured of good service at the hands of the makers. In the first place, he should know definitely what parts he himself can handle, and in this connection he should receive the counsel of the salesman. He must know also what parts are carried in stock and, what is equally important, that the parts are in stock and available upon demand.

Many firms fail in this respect, for the quantity of parts in the factory store is barely sufficient for the immediate needs of production, and the claims of the repairs section are ignored, except in the most pressing circumstances. This can be obviated by holding a stock of the most used parts at the district depôt.

Another point to be considered is that the parts in stock must be quite ready for fitting into position, and although the salesman (unacquainted with the factory procedure) may contend that mention of this is unnecessary, a good deal of delay is occasioned by failure to give attention to this point.

Every detail held in the factory store is termed "finished," which means that, as a component part, no

further operations are necessary. When a part is taken from stock for assembling with other details to form the unit, however, certain "fitting" operations may be necessary, these operations being part and parcel of the assembly. As an instance, a hole may be drilled in the part, but for this to assemble correctly into position with another part, the hole may have to be reamed, this being done by the assembler.

If this part is taken from stock and sent to a customer, it is possible that the hole will be too small, and the customer, not knowing what is amiss, will either send to the district depôt for a mechanic or will himself endeavour to enlarge the hole with a file, or something equally crude, the result being a "sloppy fit." In neither case is the customer satisfied, and it is therefore of no use telling him that he can do the job himself unless the part is quite ready for assembling.

To quote another instance, it may be that a certain part has a number of small fittings, but in the factory store the part is held without these fittings, which are added by the assembler. To the customer the part (with the fittings) represents the detail required, and it is easy to imagine his feelings if, in answer to his demand, he receives what is to him an incomplete detail.

It is such cases as these which exasperate the customer, and cause him to turn elsewhere for assistance, and not only to jobbing mechanics, but to the mechanics of a competitor also. It is easy to see that further business may be adversely affected, and although the salesman cannot be held responsible by the firm, he is responsible in the eyes of the customer, and to safeguard his own interests he must press for an efficient repairs organisation.

Having ensured adequate supplies of replacements being available, promptness in answering a call is an important factor. Probably the salesman himself is no laggard, for upon receipt of a notification he is early in attendance, but although he can promise, it is not always that he can fulfil the promise. The territory he covers is large, and that covered by the mechanic still larger, and often he does not know where the latter is to be found, or when he will be available.

Perhaps he should know this, but much depends upon the organisation of the district office. It is safe to assume that all calls are booked, and that the salesman must arrange the order of precedence. He should be able to gauge fairly accurately the degree of urgency in each case, and he can instruct the mechanic accordingly.

The supply of mechanics in any one district is based upon a normal demand, and an unforeseen call from an outlying place cannot be responded to immediately. In some cases, too, one squad of mechanics is spread over two adjoining districts, and when this is so the matter becomes even more complex.

It is difficult to suggest a remedy without knowing the specific circumstances, but in the succeeding article a suggested scheme of a repairs organisation will be submitted. It is obvious, in any case, that when repairs are being handled, there should be one mechanic on hand at the depôt for emergencies, so that the salesman is not compelled to await the return of a mechanic before investigating the customer's complaint. In other words, all calls received during one day should be responded to before the following day has expired.

Oil-Immersed Circuit-Breaker Design.

A Recent Development of the Multiple Series Break.

By C. W. DENNY, A.M.I.E.E.

IT has been known for many years that increasing the number of breaks in series per phase on a given breaker materially augments its rupturing capacity, for the reasons that it increases the speed of break and subdivides the arc, facilitating its rupture. Subdivision of the arc enables its energy to be dealt with in a number of small sections, which is much preferable to its being concentrated at a point in one large arc; and further, by a proper disposition of contacts, a strong blow-out action can be obtained.

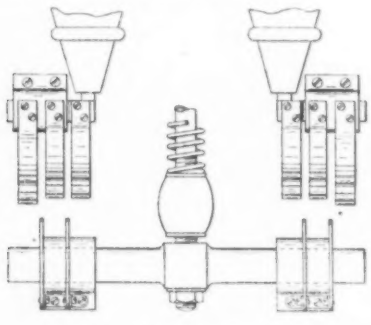


Fig. 1.—Switch Series-Contacts Open.

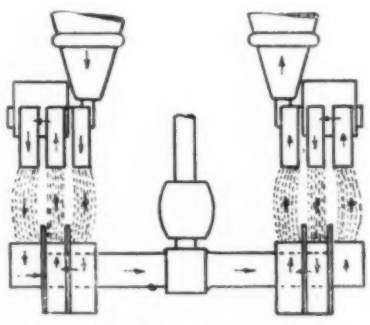


Fig. 2.—Diagrammatic Representation of Current Flow and Magnetic "Blow-out."

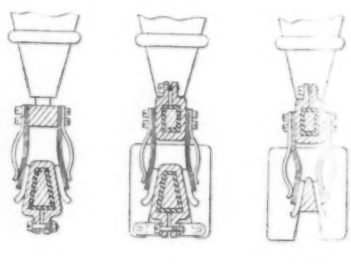


Fig. 3.—Section Through Closed Contacts.

This useful means of increasing rupturing capacity has not been generally utilised, although recently an oil-immersed breaker was manufactured on the Continent having 10 breaks in series per phase with highly successful results, and several 4-break breakers are doing good service in this country to-day. Great mechanical difficulties have to be met in the design of oil-immersed circuit-breakers having more than two breaks per phase, as it is absolutely essential for a breaker to be both robust and mechanically rigid, as any tendency to "whip" in the moving system cannot be tolerated. A recent invention has completely overcome these difficulties, and it is now possible to construct oil-immersed circuit breakers of simple and strong mechanical design which, while retaining all the admitted electrical advantages of having a multiple series break, labour under none of the mechanical disadvantages before apparent. Figs. 1, 2 and 3 illustrate one phase of an oil-immersed circuit-breaker which has been designed on this principle.

The leading-in and leading-out stems each carry a short horizontal insulated copper sleeve to which are attached two of the main stationary contacts, a third contact being mounted directly on the base of the terminal.

The moving contacts are designed in a somewhat similar manner; the moving blade carries an insulated metallic sleeve at each end so arranged as to engage when the breaker is in the closed position, with two of

the stationary finger contacts, the one attached to the terminal direct and the centre one, the third finger making direct contact with the main moving blade, and thus putting the six contacts in series.

In fig. 3 a section through each of the contacts shows the simple though robust method of support. By this construction the current is broken simultaneously at six places in each phase, three breaks at each pole.

Fig. 2 illustrates diagrammatically the direction and arrangement of the current as it passes through the breaker at the instant of separation of contacts. From this diagram quite a number of interesting facts become apparent. The arrangement of stationary contacts is such that while the breaker is closed, the contact pressure increases with the magnitude of the current flowing, which is of great importance. When the circuit-breaker contacts begin to separate, however, the direction of flow of current is such as to produce a strong magnetic blow-out action which definitely keeps the arcs separated, accounting for the outward bulge shown in the diagram.

This bulge lengthens the arcs, increasing their resistances and facilitating rupture; it can be seen, therefore, that the electrical advantages of a multiple series break have been utilised to the utmost without sacrificing mechanical considerations.

The same fundamental principle may be incorporated in the design of air circuit-breakers and contactors with very gratifying results, and it is felt that this development will undoubtedly prove a valuable asset in hastening the complete solution of at least one problem that besets the switchgear designer.

Legal.

Re C. & B. Dawson & Bros., Ltd.

In the Companies' Winding Up Court on May 19th, Mr. Justice Eve declined to make an order for the winding up of C. & B. Dawson & Bros., Ltd., dealers in radio accessories. Dismissing the petition of Arthur Hyams & Co., Ltd., judgment creditors, his Lordship said that the company was incorporated in October, 1924, and a voluntary winding-up resolution was passed in April last. It had had an unfortunate career because by the end of six months it had not only lost all its share capital but was indebted to the extent of £2,000 or £3,000. The petitioners alleged that they and the other creditors of the company would be prejudiced by the voluntary winding up. It was to some extent a matter for congratulation that the company when it found it could not pay its way determined to do what was right and to suspend its operations and allow its assets to be realised for the benefit of its creditors. A majority of creditors in number and amount were opposed to a compulsory winding up.

Edgar Allen & Co., Ltd., v. Stobie.

In the Court of Appeal, before Lord Justices Bankes, Scrutton and Atkin, on May 18th and 19th, the case of Edgar Allen and Co., Ltd., *v.* Victor Stobie, was heard upon the appeal of the plaintiff company from a judgment of Mr. Justice Greer in the King's Bench Division, in favour of the defendant, who traded as the Stobie Steel Company or the Stobie Metallurgical Construction Company (*vide* ELEC. REV., March 27th, p. 520). The question to be determined by the Court was whether there was a guarantee by the defendant that two electric furnaces supplied by him to the appellants should produce 200 tons of steel at a consumption of 700 kWh per ton or should merely produce the named quantity at a commercially economic cost. The defendant's contention was that the purpose for which the furnaces were required was not definitely communicated to him nor was he asked to contract with regard to current consumption.

Mr. Justice Greer decided that it was an implied term of the contract, in correspondence between the parties, that the furnaces should produce 200 tons of molten steel per week at a commercially economic cost; but he found against the appellants on their claim that there was a guarantee by the defendant that the furnaces would work at not more than 700 kWh per ton.

Mr. LOWENTHAL, in support of the appeal, said that the cost of the furnaces and the installation, which the appellants had to bear, was upwards of £20,000. When the furnaces were delivered they failed to do what was required; they were tested four times, and although at the last test an output of 200 tons was managed it was at a very much greater consumption of energy than that contracted for.

Mr. JOWITT, K.C., supported the judgment of Mr. Justice Greer on behalf of the defendant. He said that to determine the question at issue it was necessary to look at all the surrounding circumstances apart from the correspondence. He submitted that some of the letters on which the plaintiffs relied as constituting a guarantee as to consumption were not of a contractual character.

At the conclusion of the arguments their Lordships dismissed the appeal with costs.

Stone v. Machin.

In the Shoreditch County Court, on May 19th, before Judge Cluer, Mr. Frederick Stone, trading as the Lighting Supplies Company, Finsbury Avenue, E.C., wireless accessory and electrical goods manufacturer, sued Mr. F. R. Machin, Balham, S.W., mechanical and electrical engineer, to recover £11 3s. 4d. for a quantity of radio goods supplied, and £2 damages for their detention. The goods comprised top plates, nuts, bolts, spring washers, metal bushes and screws, &c. There was a counterclaim by the defendant for £60 19s. 11d., which represented the expenses to which he had been put in taking premises on the understanding that the plaintiff was going to increase his order from £12 a week to £35 a week, and he arranged to borrow £50 for a capstan lathe to carry out the work.

MR. STURGESS, for the plaintiff, said that defendant could not pay the fee on his counterclaim, whereupon Judge CLUER said that the case would have to proceed without the counterclaim.

The plaintiff then gave evidence that he arranged with the defendant to assemble some wireless variable condensers, and supplied him with the parts.

The defendant said that he had promised to deliver the goods to plaintiff's address. When the parts were sent to him they were only small parcels, but when they were made up, it necessitated their being packed up in crates. The plaintiff had agreed to meet him over the cost of the carriage, but he had not done so.

Judge CLUER said that he had guaranteed to deliver the goods and would have to do it.

The prices charged by the plaintiff in some cases were objected to by the defendant, and Judge Cluer eventually made a small allowance, and gave a verdict for the plaintiff for £10 11s. 11d. and costs; he also gave a verdict for Mr. Stone on the counter claim, and told the defendant that he could bring an action later if he wished to.

The Extension of Tesla Patents.

In the Chancery Division, on May 19th, Mr. Fletcher Moulton applied to Mr. Justice Tomlin to fix a day for the hearing of a petition for the prolongation of the term of patents owned by Mr. Nikola Tesla, the American electrical scientist and inventor. Mr. Moulton asked that the day fixed be October 13th next, which would give time for the inventor to come over from America and give evidence. The patents expired on October 21st. They related to very expensive machines, all of which were built in America.

His Lordship acceded to the request.

Powers v. Freer.

On May 21st, on behalf of Mr. Thomas Powers, chairman of the Earl Shilton Gas Light & Coke Co., counsel, in a King's Bench Divisional Court, consisting of Justices Salter and Greer, moved for a rule directed to Mr. Wm. Freer, chairman of the Barwell Parish Council, to show cause why a writ of *mandamus* should not be issued against him, directing him to hold a poll of the electors of the parish of Barwell on the subject of the decision of the Parish Council to introduce electric lighting.

Mr. J. B. MELVILLE, for Mr. Powers, said that under Rule 65 an affidavit should be produced, made by the applicant or his solicitor, stating at whose instance the motion was made. Such an affidavit had not been provided, and would later be supplied. But the motion was at the instance of Mr. Thomas Powers, of Barwell, farmer and engineer and chairman of the Earl Shilton Gas Light & Coke Co., which supplied gas to Barwell. Mr. Powers was an owner and occupier of property in Barwell. The rural parish council electors on the register numbered 3,098. Mr. Powers, who was a member of the parish council, stated by affidavit that a printed notice of a parish meeting was issued, signed by Mr. Freer, calling a special parish meeting for May 4th to consider a proposal to raise £900 to establish electric lighting in the parish. The deponent attended the meeting and voted against the resolution. Seventeen voted for the resolution, 14 against, and 20 did not vote. The chairman of the meeting, Mr. Freer, declared the resolution carried on a show of hands, but Mr. Powers demanded a poll. The chairman refused to take this. Mr. Melville said that the Earl Shilton Gas Light & Coke Co. supplied gas to Barwell.

Their LORDSHIPS said that in a matter of this kind it was desirable that there should be as little delay as possible. Subject to an affidavit being made showing at whose instance the writ of *mandamus* was applied for, the rule would be granted and the matter would be heard by the Court early in the next term.

A Short-circuit at a Scottish Colliery.

WHEN a young Fifeshire miner pleaded "Not guilty" at Dunfermline Sheriff Court on May 19th to a charge of having wantonly and maliciously thrown a piece of chain over two electric cables, causing a short circuit, a colliery electrician stated that as a result of the short circuit the electricity serving five pits was cut off for four hours, during which time operations at the pits were at a standstill. The Sheriff held that it had not been proved that the piece of chain was deliberately thrown in the direction of the cables and found the accused "Not guilty."

Reviews.

Electrical Engineering. By L. A. HAZELTINE, M.E., Professor of Electrical Engineering in the Stevens Institute of Technology. Pp. xvi+625; figs. 364. London and New York: Macmillan Co. Price 30s. net.

During the last five years numerous text books on electrical engineering have originated in America, in many of which the subject has been treated in a very orthodox manner. This comment cannot be made in regard to the book under notice, which has evidently been written by a man holding strong views on the teaching of electrical engineering and who is not afraid to put them forward.

In connection with the choice of matter in the book we find that one-third of the space available is devoted to the purely scientific side of the electrical and magnetic principles and theories underlying electrical engineering, including a very interesting chapter on conductivity in gases and electrolytes. Coming to the portions of the book dealing with technical applications, we find that instruments and measurements are dealt with at length, while machines have rather less space devoted to them than would be expected in a book comprising over six hundred pages. Despite this limitation, a good deal of accurate information concerning machines is given without going deeply into details. The subject of electrical transients is dealt with at great length, and forms perhaps the most interesting and useful section of the book, while the concluding chapter deals with electrical communication, and in it are given outlines of the methods and circuits employed in telegraphy and telephony, both "wired" and "wireless" methods being included.

It is noteworthy that the units used in connection with electromagnetics and electrostatics are those connected with the so-called rational system which has been used by several well-known writers. To those who are accustomed to the more usual units of the system based on the definition of unit pole, and this remark applies to most engineers, the system used certainly retards the rate at which the matter can be read and absorbed, but this difficulty would not be met with if the rational system was universally adopted. It is clear that the author feels very deeply on the matter, and the relative merits of the two systems are very comprehensively and fairly discussed. The proposed system has, in the mind of the reviewer, one great advantage—it prevents the permeability of a vacuum being taken as unity, which seems to be often productive of difficulties to those studying magnetic work.

Another matter on which the author lays great and repeated stress is the question of the importance of the consideration of the energy relations in electrical and magnetic problems, and here there can be no difference of opinion as to the desirability of the author's method, since there is no matter of greater importance arising in the study of electrical engineering.

The book is carefully and accurately written, and is worthy of the attention of all electrical engineers who, by its perusal, will absorb much useful information concerning the physical aspect of electrical engineering. It should be included in the libraries of all technical universities and colleges.

The Story of the Atom. By W. F. F. SHEARCROFT. Pp. 80. London: E. Benn, Ltd., 1925. Price 3s. 6d. net.

Mr. Shearcroft's little "Story of the Atom" is a fascinating exposition of the new discoveries relating to the atom. It is written in non-technical language and more particularly for the general reader from a popular point of view, but no effort has been spared to get to the root of the matter. The author gives a short account of the birth of science, atomic theories, radio-activity, disintegration, atomic structure and isotopes. The matter is presented in such attractive form that even the man in the street might read the book with pleasure and profit.

In writing this volume an attempt has been made to summarise the chief phenomena and theories relating to the study of the atom in a concise, lucid and simple form. It is unnecessary to point out the difficulty of doing this with a subject in which the results of new and important investigations are being continually published. Detailed theories are necessarily mathematical and the elimination of all mathematics results inevitably in a certain degree of inexactness; however, a compensation is found in a greater clarity for the non-specialist reader to whom alone the volume is addressed.

When science seeks to find the units of which matter is composed, it is led to continually smaller particles. The largest unit is the molecule, but a molecule as a rule is composed of atoms of several different elements. According to the modern conception, each atom consists of one central nucleus around which revolve one or more electrons, much as the planets revolve round the sun. Concerning the deeper nature of the electron and of the central particle, very little is known, and, for the present, they are accepted as being the ultimate building stones of matter. The dimensions of the nucleus are supposed to be about 100,000 times smaller than the atoms. It is assumed that a force exists within the atom corresponding roughly to the force of gravitation in the planetary system. No reason exists for assuming that electrons have a structure, but future research may even subdivide electrons. The electron is charged with negative electricity, and the central particle or proton with positive electricity, the numerical value of the charge being 1.60 by 10^{-19} coulomb, an almost inconceivably minute quantity of electricity. Radio activity and transmutation are possibly related to the structure of the nucleus, and from Rutherford's recent classical researches there is a possibility of the application of atomic power, electromagnetic radiation, and transmutation of the elements in the service of man. Knowledge of the atom is obtained by three methods, the spectroscope, X-rays and radio-activity. The hydrogen atom is studied by means of the spectroscope, electrons by X-rays, and the nuclues by radio-activity, which is only found among the heaviest atoms of complex structures. Radio-activity is associated in popular thought with radium, but in fact, the discovery of radium was caused by that of radio-activity and not *vice versa*.

The book under review has a modest aim, but it is not an easy task to write well on such a subject as the atom, and Mr. Shearcroft may be congratulated on the success with which he has managed its arrangement and proportions. The book can be recommended as fulfilling its mission admirably. The volume offers a bridge whereby the educated can enter into the realms of the specialist, it covers considerable ground, has been well thought out and systematically arranged. It has not the dryness of a textbook, is extremely readable and astonishingly interesting.

Principles of Transmission in Telephony. By M. P. WEINBACH, A.B., B.S. in E.E., A.M. Pp. xiv + 303; figs. 91. London and New York: McMillan Co. Price 17s. net.

This volume of the Engineering Science series is written with the object of providing students of telephone transmission with a manual on the subject which will enable them to obtain a sound and comprehensive grasp of the principles underlying the calculations connected with the various types of circuits whose transmission values have to be ascertained by the telephone engineer. Following what appears to be a somewhat general practice in text books of this class, the author devotes the earlier part of his work to an explanation of harmonic and hyperbolic functions, the application of which is required for the subsequent mathematical treatment of the subject.

In all, this volume contains seventeen chapters, the first three of which are devoted to an introduction to the principles of speech transmission, harmonic and hyperbolic functions. These are followed by a chapter dealing with the general equations of electric wave propagation, in which expressions are found for the propagation, attenuation, and wave-length constants of a line which for purposes of numerical illustration is an aerial No. 10 B and S.

Chapters V, VI, and VII, deal respectively with the infinitely long line, the open-circuited line and the short-circuited line. In the case of the open-circuited line the conditions for resonance giving rise to the "Ferranti effect" are fully and clearly discussed.

Chapter VIII is devoted to an investigation of the case when the line under consideration is terminated at the distant end through any impedance which produces a phase angle of any value θ, and the analysis proceeds to present, in a general form, what were treated as special cases in open and short-circuited lines, the former being regarded as a line having an infinite impedance at the receiving end and the latter as having zero impedance at the receiving end.

The two following chapters are occupied with energy transfer, reflection, and power relations; and a very simple and clear explanation is given of the phenomenon of "surge impedance" resulting when the energies of the electric and magnetic fields are equal.

Chapter XI, dealing with the "equivalent circuit," is an important one and is treated at considerable length.

In Chapters XII and XIII, the phenomena of distortion and distortionless transmission are discussed preparatory to an investigation of the inductively-loaded line. The numerical calculations which the author gives for the transmission constants for different methods of "loading" will be found exceedingly useful in view of the important results this device has achieved in extending the speech limit on overhead lines and underground cables.

In Chapters XIV and XV, the theory of the triode thermionic valve is outlined, as also is its application to telephone repeaters in the form of amplifiers.

Practical methods for the measurement of line impedance are discussed in chapter XVI, and in the final chapter of the book "transmission equivalents" are investigated. As in previous

cases, these are illustrated by suitable numerical examples. A very complete bibliography and list of symbols are given at the end.

This volume of Prof. Weinbach will prove to be a very welcome addition to the existing literature on telephone transmission. Although much of it has appeared before, the author has, nevertheless, presented the subject in a manner that will appeal to British readers. The language is clear and precise, and the formulæ are built up in a way that will be appreciated by the mathematical reader. Mainly devoted, as it is, to telephone transmission, it will also be of use to those students of electrical engineering who are concerned with power transmission. The printing of the book is excellent and is interspersed with numerous curves and diagrams illustrative of the context.

Will's Electric Lighting (Fifth Edition). Edited by JOHN C. DALTON, A.M.I.E.E., barrister-at-law. Pp. xlii+498. London: Butterworth & Co. Price £2 2s. net.

This is the fifth edition of the standard work on the Electricity Supply Acts, revised and brought up to date, the fourth edition having been published some 12 years ago.

We can unreservedly say that this is a book which should be bought by every supply undertaking, seeing that the industry is regulated in the whole of its administration by legislation. Every manager of any section of an undertaking should have at his fingers' ends the Acts so far as they refer to his department, and, too, should have sufficient general knowledge of the whole of the Acts to enable him to readily turn up the section dealing with any matter in question. "Will's Electric Lighting" gives the whole of these general Acts bound up in the handiest possible form. Further—and this is a point of the utmost importance—where a section of any Act is repealed or modified, such alteration is shown in the section in question. In a number of instances, later Acts have modified earlier Acts, so that even if we have the text of any Act as officially published, it is not necessarily a guide to the *existing* law on the point. But in Will's all Acts have the necessary corrections appended to the text.

Further, elaborate explanatory notes are given against the various sections, including definitions of terms used, and references to legal decisions on cases which have arisen out of the section and which therefore interpret the section. In this respect, also, all departmental managers or engineers will do well to peruse the volume, since these cases will give him gratis an experience of the working of the Acts, and reveal many an unsuspected pitfall.

Although the volume is called Will's Electric Lighting, there is also a short section dealing with the law relating to electric traction. A short summary of the contents of the volume may, perhaps, convince of its indispensability, at least, to electric supply undertakings.

Part I, which occupies 403 pages out of a total of 441, deals with the law relating to electric lighting and power. Chapter I gives some brief introductory comments on the legislation generally. Chapter II, which is a most useful one, includes a summary under convenient headings of the powers and duties of electric supply undertakers under Provisional Orders, so that the reader may get, as it were, a bird's-eye view of what he must do, of what he can do, and of what he must not do, so far as the law is concerned. Chapter III is a special chapter in so far as it deals with electric supply undertakings in the County of London and the legislation which is peculiar to the London undertakings. Chapter IV is entitled "Power Acts." There is a fairly useful review in this chapter of the distinctive features of a "power" company, and a summary of its general powers and duties. But seeing the important part which power companies will probably play in the future, we think this chapter might certainly be fuller. We think, too, that a reference should have been made in this chapter to the "special provisions as to power companies" contained in Section 17 of the Act of 1923, and also to the limitation of the powers of a joint electricity authority in respect of a power company's area as provided in Section 12 of the Act of 1919. The relation of a joint electricity authority to any power company in its area is of a special nature, and a power company is much more radically concerned than an authorised distributor, hence the importance of the protective provisions. Chapter V summarises the powers and duties of joint electricity authorities and advisory boards and committees. Chapter VI deals with miscellaneous legislation affecting the industry from the Factory and Workshop Acts down to the Trade Facilities Acts. These six chapters are all introductory. We then come to the real body of the book, which is the "Statutes." This is prefaced by a useful recital of the sections of the whole of the Acts. Then follows the text of the general Acts in order of date, together with editorial notes, references to cases, and so forth. The Acts relating to the County of London are grouped together, and similarly annotated. A very useful section follows, namely, the form of a Special Order and types of special clauses and the Commissioners' regulations as to application for Special Orders, together with model forms of the various notices which have to be served, and full details as to procedure. Finally, there are the Commissioners' general regulations as to safety and supply and extra-high-pressure and overhead wires.

There are one or two suggestions which have occurred to us in running through the volume. On page 19 there is a summary of the law on the "recovery of charges." A point which might fittingly be included in this paragraph is the right given to undertakers in the Clauses Act, 1899, Section 27, Subsection 3, to demand a deposit. In the same paragraph the introductory words are not quite clear. They read: "If any consumer neglect to pay to the undertakers *any* charge for electricity or other sum due to them from him, the undertakers may cut off the supply. . . ." And reference is made to the Act of 1882, Section, 21. This section, however, specifies that the "other sum" must be "in respect of the supply of electricity." Now undertakers are empowered to let on hire fittings, apparatus, and appliances (*vide* Act 1909, Section 16, and Act 1919, Section 23), but can failure to pay such hire be a "sum due" in regard to which the undertakers can cut off the supply?

On page 56 of the Introduction, reference is made to the assistance which supply undertakers may obtain under the Trade Facilities Acts. No mention is made of the direct financial assistance which can be obtained from the Unemployments Grants Committee, which was subsequently extended to companies as well as to local authorities.

Part II of the volume deals with electric traction law, and after a comprehensive introduction, gives the text of the Railways (Electrical Power) Act, 1903, Railways Act, 1921, Sections 16 and 17, and rules made by the Minister of Transport under the former Act and as regards electrical power on tramways and light railways, and regulations as to guard wires, &c., also rules of procedure are given, other detail information.

Finally, we think the industry is to be congratulated on having so complete a compendium of the law in so handy a form and brought closely up to date.

Business Notes.

The Electricity Commission: New Offices.—On June 1st (Monday next), the Electricity Commissioners are removing from Gwydyr House to Savoy Court, Strand, W.C.2. (Telephone No.: Gerrard 7565.)

Engineering Employés' Wages.—A meeting of the engineering trade unions was held in London on May 20th to consider the proposals put forward by the Engineering and Allied Employers' Federation in response to the unions' application for an increase of 20s. per week in the wages of their members. The proposals, as already reported, amount to an extension of the working week to 50 hours with a net increase in wages of 5s. The counter-proposals had been discussed by the executives of the unions and the conference was called for the presentation of their views. It was unanimously decided not to accept the employers' suggestions, and the decision has been communicated to the Federation.

The Needs of Industry.—We have received from the Federation of British Industries a copy of a speech which the President, Col. Willey, delivered at a dinner given in his honour by the Liverpool branch of the Federation. Col. Willey said that the only way to expand our industries was by exporting more goods. Before the war our exports were stimulated by generous credits but to-day we had to demand more exacting terms of payment. The German banking system utilised its power as trustee for German depositors to guide their resources into those channels which would give the greatest employment to German labour and increase foreign trade. Our bankers, as custodians of the country's deposits, were firmly entrenched behind traditional success based on another system. When we were virtually alone in the industrial field our system was admirable, but to-day it would seem inevitable that if we were to expand our industry more generous financial facilities must be provided, either by an extension of Government facilities or the enlargement of private procedure. We had to advance beyond the theory that the obligation on the banking system of this country was only to furnish resources for domestic production and a short-credit operation in foreign distribution. Col. Willey referred to the credit insurance proposals put forward by the Federation (*vide* our last issue, p. 814), as one means of assisting foreign trade.

As an example of a foreign market which presented great opportunities for British traders, the speaker instanced Poland, which he said was not only a market in itself but a stepping stone to trade with Russia.

Engineering Employment During April.—The May *Ministry of Labour Gazette* reports that employment in the engineering industry during April remained bad upon the whole, although in most districts electrical engineering made a good showing. The position is indicated by a table in which the general engineering unemployment figure is given as 11.5 per cent., while in the electrical branch it was only 5.6 per cent.

Trade Announcements.—MESSRS. CLOWES & GRIFFITHS, who are starting business as electrical engineers at 24, Bertie Road, Willesden, N.W.10, ask for catalogues, &c.

THE SELSON ENGINEERING CO., LTD., is now occupying its new buildings at 26-28, Charles Street, London, E.C.1, close to Farringdon Street station, where it has a showroom in which a complete range of machine tools is displayed. The premises are fitted with electric cranes, lifts, &c., for handling both small tools and large machinery up to 10 tons weight.

Bankruptcy Proceedings.—W. A. HUNTLEY, 62, Albion Street, Leeds, late of Bradford, X-ray engineer.—The first meeting of creditors was held on May 18th at Harrogate. The statement of affairs showed liabilities of £1,213, while the assets were all absorbed by preferential claims. Debtor attributed his present position to lack of working capital, keen competition in the wireless business, heavy travelling and general expenses, and bad trading. The case being a summary one was left with the Official Receiver as trustee. The following are the principal creditors :—

	£		£
Cox Cavendish Electric Co., Ltd.	440	Fifield, F. W.	330
Ackroyd, Thos.	35	Bankers	250

GEORGE AMERY, radio apparatus and accessories merchant, 3, Greville Road, N.W.—The public examination of this debtor was held last week at the London Bankruptcy Court, the accounts showing liabilities of £3,049 against assets valued at £60. In the course of his evidence the debtor stated that his radio business resulted in a loss up to November, 1923, in consequence of his allowing customers greater discounts than he received. In that month he was allowed an increased discount by the manufacturers, but owing to keen competition from other factors his margin of profit was insufficient to meet his business expenses. In May, 1924, witness purchased the stock of £406, goodwill, fixtures and fittings for £500 (of which only £250 was paid), which he thereafter carried on under the existing name of "Cope's Wireless Stores." Under the agreement the vendors were entitled to take possession if default was made in payment of the instalments of the purchase money. From July, 1924, owing to ill-health, the business was neglected; default was made in September, whereupon the vendors took possession, and witness had since traded from his private address. The following are the principal creditors :—

	£		£
Auto Sundries, Ltd.	28	Philips Valve Co., Ltd.	105
Cable & Electrical Supplies ...	841	Sun Electrical Co., Ltd.	20
Dubilier Condenser Co., Ltd. ...	95	Brown, S. G., Ltd	47
Eagle Electrical Co., Ltd. ...	25	Watmel Co.	26
Darag (London), Ltd.	478	Telephone Mfg. Co.	68
Hills, E. H., Ltd.	43	Archer Preen & Co.	34
Hope & Norman	158	Burndept, Ltd.	68
G. & L. Electric Co.	52	Metro-Vick Supplies, Ltd. ...	107
Metropolitan-Vickers Electrical Co., Ltd.	505	Cohen, H.	185

S. T. HOSKEN, radio accessory manufacturer and factor, 153, Fleet Street, E.C.—The first meeting of creditors was held last week at the London Bankruptcy Court, when accounts were submitted showing liabilities of £953, against assets valued at £33. It appeared from the debtor's statements that trade began to fall away some months ago, and he realised that he would not be able to do sufficient trade to pay his debts and accordingly filed his petition. He attributed his insolvency to a general decline in the wireless trade, heavy expenditure and cost of advertising. In the absence of any offer Mr. C. Latham, 15, Eastcheap, E.C., was appointed trustee to administer the estate in bankruptcy.

JAMES ADDY, wireless and cycle dealer, Bridge End, Long Preston, Yorks.—The first meeting of creditors was held on May 19th at the offices of the Official Receiver, Bradford. Debtor's statement of affairs showed liabilities amounting to £179 and assets estimated to produce £26. The estate was left in the hands of the Official Receiver (Mr. J. O. Morris).

H. A. BIRLESON (Birleson & Co.), electrical engineer, Clarence Buildings, Fazackerley Street, Chorley.—Last day for proofs for dividend, June 2nd. Trustee, Mr. H. Parker, Official Receiver, 11, Winckley Square, Preston.

S. HOLMES, electrical engineer, 5, Gibson Street, Burnmantofts, Leeds.—First and final dividend of 4s. 8d. in the £, payable at the Official Receiver's office, 24, Bond Street, Leeds.

G. W. H. HANFORD (Radio Manufacturing Co. and the O.I.C. Mfg. Co.), 37, Gold Street, Southsea.—First and final dividend of 1s. 3½d. in the £, payable at the Official Receiver's office, 87, High Street, Portsmouth.

J. A. REFOY (Varley Radio Co.), dealers in wireless apparatus, 178, Ancona Road, Plumstead.—First meeting, May 27th, at 29, Russell Square, W.C. Public examination, June 23rd, at the Court House, Greenwich.

R. RUDD, electrical engineer, Long Ashton, Somerset.—Trustee, Mr. F. W. Darley, Official Receiver, 26, Baldwin Street, Bristol, released May 11th.

RADIO CASH STORES, electricians, 371, Upper Street, Islington, N., 5, New Station Street, Leeds, and Parliament Street, Nottingham.—Receiving order made May 14th, on creditor's petition. First meeting June 3rd, public examination June 23rd, both at Carey Street, W.C.

J. E. CRACKNELL, photographer and wireless supplies dealer, High Street, Manningtree.—Receiving order made May 19th, on debtor's own petition.

A. T. K. MOIR (Moir & Watts), electrical and mechanical engineer, Weardale Road, Lee, Kent.—Receiving order made May 19th, on creditor's petition.

J. N. DAVENPORT and L. A. HACKETT (Davenport, Hackett and Co.), electrical engineers and contractors, 36, Spring Gardens, Manchester.—First meeting May 29th, at the Official Receiver's offices, Byrom Street, Manchester. Public examination June 10th, at the Court House, Manchester.

F. H. P. HOOLAHAN (Holloway Bros.), electrical engineer and instrument maker, 16, The Hale, Highams Park, and 299, Holloway Road, N.—Application for discharge to be heard on June 12th, at Carey Street, W.C.

J. F. GUEST (L. D. & J. Guest and Guest & Robinson), plumber, electrician, and hardware dealer, 97, Great Horton Road, and Barkerend Road, Bradford.—Bankrupt discharged subject to consenting to judgment for £1 being entered against him and payment of 30s. costs of judgment (£1 paid to the Trustee in lieu of entering up judgment).

R. HAMMOND, electrical engineer, 2, Palewell Villas, Upper Richmond Road, East Sheen, and 3, The Arcade, George Street, Richmond.—First and final dividend of 2s. 11d. in the £, payable June 2nd, at Messrs. Poppleton, Appleby & Hawkins, 4, Charterhouse Square, E.C. Discharge suspended for two years, until March 23rd, 1927.

A. H. DUFFIN and G. KERSHAW (A. H. Duffin & Co.), electrical engineers and contractors, Provincial Buildings, Conway Road, Colwyn Bay.—Last day for proofs for dividend, June 2nd. Trustee, Mr. P. W. Aston, Mostyn Chambers, Colwyn Bay.

Company Liquidations.—DARAG (LONDON), LTD., radio apparatus importers and electrical factors, 8, Southampton Row, W.C.1.—A meeting of the creditors of this company was held on May 19th at the offices of Messrs. Westacott, Quaife and Co., Fenchurch Street, E.C. Mr. A. E. Quaife, the liquidator in the voluntary liquidation, presided. An approximate statement of affairs was presented which showed ranking liabilities of £12,439, made up as follows :—Trade creditors, £12,258; rent, telephone, &c., £107; and partly secured creditors, £74. The total claim of the partly secured creditors was £231, but securities were held of the estimated value of £157. The assets were estimated to realise £43, from which had to be deducted £13, for preferential claims, leaving net assets of £30, or a deficiency of £12,408. The chairman said that the company was registered on March 27th, 1924, with a nominal capital of £1,000 in £1 shares. It appeared that a gentleman named Mr. S. Flatto, who was either a Russian or a Pole, was in this country on a passport, and formed the company with the idea of selling wireless goods which he was able to buy from German houses. For a while a sound business was done, but eventually the company came into connection with a concern called Importex, Ltd., of 122, Bunhill Row, E.C.1. A gentleman named N. A. Ludwin was connected with Importex, Ltd., and presumably he was successful in getting a lot of goods from Darag (London) Ltd. Eventually Ludwin became a director of Darag (London), Ltd., but he was only on the board a very short time. At one period Mr. Flatto went abroad, and his story was that during his absence and against his wishes Ludwin continued to supply Importex, Ltd., with substantial quantities of goods. The procedure followed was for Darag (London), Ltd., to buy goods from German and other manufacturers, sell them in this country and immediately take bills in payment which were transferred to the German suppliers. Had those bills been good the creditors would probably not have been meeting together that day. He was unable to say what Importex, Ltd., and others to whom goods were sold had done with them. Darag (London), Ltd., got the goods, and supplied them to somebody else, and in return received bills. His information was that practically the whole of those bills had been returned and they were not worth a penny. The company had had large dealings with Importex, Ltd., who were supposed to be debtors to the extent of £6,235. Substantial dealings had also been entered into with G. Busl (The Wireless Warehouse), Ltd., who were said to be debtors to the extent of £3,694.

Mr. C. MIDDLEDITCH said he was representing Mr. C. Latham, who had been appointed as one of the joint liquidators in the voluntary liquidation of G. Busl (The Wireless Warehouse), Ltd., and he would like to know whether goods had actually passed in respect of the whole of the balance of £3,694 which was said to be outstanding.

Mr. QUAIFE replied that he was given to understand that bills were handed over for more than the amount of goods which were actually delivered to G. Busl (The Wireless Warehouse), Ltd.

Mr. MIDDLEDITCH inquired if any allowance was being made for a liability by Darag (London), Ltd., to G. Busl (The Wireless Warehouse), Ltd., in respect of bills for which no goods ever passed.

Mr. QUAIFE said the transactions were by no means clear. There were transactions without goods being supplied. He had only brought in to the liabilities bills which were given in respect of goods handed over. A letter had been received from Mr. Flatto's father offering to subscribe £700 for the creditors. Mr. Quaife added that he could not help thinking that in the early days Darag (London), Ltd., was a business which it was intended should prosper in the ordinary commercial way. The trouble started when Mr. Flatto met Ludwin.

Another creditor asked what had become of Ludwin, and Mr. QUAIFE answered that he resigned from the board of Darag (London), Ltd., just about the time when it was decided that liquidation should take place. The chairman said that he was told that Importex, Ltd., had left Bunhill Row.

The Chairman, in answer to questions, said that although quantities of goods were supplied to Darag (London), Ltd., they were not paid for. Some of those goods went into other companies, but he was unable to say what then happened to them. It might be that some of the goods which Darag (London), Ltd., had sold to others had found their way to Italy. In addition, Darag (London), Ltd., had not received cash for the goods. The offices of Darag (London), Ltd., were only small, there was very little accommodation, and the goods purchased went straight from the docks to Importex, Ltd., and others. He was told that instructions were given to the forwarding agents by Ludwin for the delivery of goods to Importex, Ltd., during the time he was a director. A third director (Mr. Francis) had no knowledge whatever of many of the transactions which the company entered into. The books were not properly kept, but there were a number of genuine customers who had paid up well.

Mr. F. W. FRANCIS, one of the directors of the company, stated that as far as he knew no goods were sold to Italy. He was not aware that any goods belonging to Darag (London), Ltd., were sold to any of the directors. Ludwin became a director in January last, and previously there had been dealings with Importex, Ltd., which were quite satisfactory. He believed that the transaction representing £2,867 with Importex, Ltd., was in respect of condensers. It was arranged that those goods should be handed over against bills which were held. The goods were returned and the bills were given up. It was untrue that goods had been sold at less than cost price. He knew nothing about an order which was placed for 8,000 headphones shortly before the liquidation took place. It was quite correct that bills were given before goods were delivered. He was given to understand that the German manufacturers required something negotiable in order to pay their workers before they started to deliver goods.

The chairman said that the landlord at Southampton Row had taken possession of the assets there and there was nothing whatever remaining for the creditors.

The creditors decided to confirm the voluntary liquidation of the company, and appointed a committee of the representatives of three of the creditors to investigate the matter with Mr. Quaife.

The following are creditors :—

	£		£
Apparatebau u. Uhrenfabrik (Germany)	650	Grosswendt, Herbert (Germany)	431
Batterie u. Elementebau (Germany)	372	Henley, Albert A., & Co. ...	26
Bayrische Telefonfabrik A.G. (Germany)	64	Kultin Rundfunk (Germany)...	2,411
Ema, G. M. C. H. (Germany)	2,825	Nash & Alexander, Ltd. ...	28
Fetag, S. O. (Germany) ...	87	Orient Export & Import (Germany)	260
Hoch und Niederspannungs (Germany)	576	Robb Bros. (Glasgow), Ltd. ...	92
		Berliner, J. (Germany)	4,490

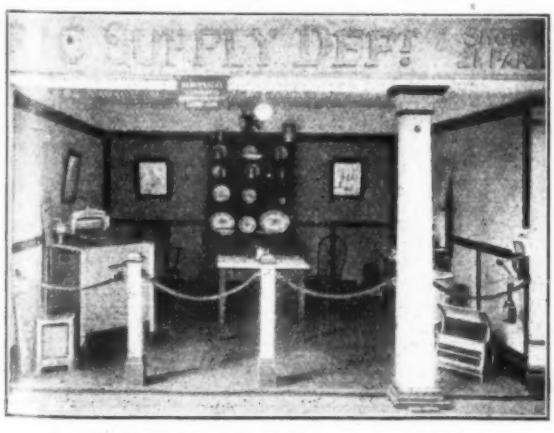
WIRELESS WAREHOUSES, LTD.—A meeting of creditors was called for May 27th at the Cannon Street Hotel. Particulars of claim to the liquidator, Mr. P. S. Booth, 19, Kimberley House, Holborn Viaduct, E.C., by June 15th.

RADIO SUPPLIES, LTD.—A meeting of members is called for June 19th at Norwich House, Southampton Street, Bloomsbury, W.C., to hear an account of the winding up from the liquidator, Mr. W. W. Smiles.

CARDIFF ELECTRIC AND WIRELESS SUPPLY CO., LTD.—A general meeting of the company is called for June 22nd, at Andrew's Buildings, 67, Queen Street, Cardiff, to hear an account of the winding up from the liquidator, Mr. T. H. Coath.

BRITISH RADIO SALES CO., LTD.—Liquidator, Mr. G. D. Pepys, Official Receiver, Carey Street, W.C., released May 18th.

The National Trades Exhibition, Birmingham.—At this exhibition, which was held at Bingley Hall from March 16th to May 9th, the Corporation Electric Supply Department again had an interesting display on a scale commensurate with the



An Electrical Exhibit at the National Trades Exhibition.

importance of the subject treated. The exhibit took the form of a model kitchen and a model dining room. In the former, which is depicted in the accompanying illustration, there were arranged an electric cooker, a washing machine, fires, a wash boiler and a number of other labour-saving appliances. The dining room contained other fires, a vacuum cleaner, coffee percolators, toasters, and other small devices for table cooking, &c.

Local Exhibition.—HARWICH.—We reproduce herewith a view of one section of the exhibition recently organised at the Dovercourt Drill Hall by the Corporation Electricity Department. A number of local contractors co-operated with the department and cooking was demonstrated by the Jackson Electric Stove Co., Ltd., and the Hotpoint Electric Appliance Co. Ltd. Our illustration shows the stand arranged by the G.E.M. Co., upon which a comprehensive range of appliances was displayed. The supply in Harwich was commenced as

A Section of the Harwich Exhibition.

recently as January last, but the department already has over 200 consumers on its mains. A scheme of rental wiring and cooker hiring has been instituted and one result of the exhibition was the booking of orders for 32 cookers so that a good proportion of the consumers will now cook electrically.

Dissolution of Partnership.—LIGHTNING CO., manufacturers of super-electrolyte, 179, Grove Street, and 9, Mount Street, Liverpool.—Mr. G. W. Tatman and Mr. P. L. Vetter have dissolved partnership. Mr. Vetter will attend to debts and continue the business.

Catalogues and Lists.—THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—A folder, with an attractive illustration on the front, giving details and prices of electric fans.

CALLENDER'S CABLE & CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, E.C.4.—A pamphlet containing practical illustrations and particulars of the "Kaleeco" watertight junction box for wiring installations.

THE MULLARD RADIO VALVE CO., LTD., Nightingale Lane, Balham, S.W.12.—A poster advertising reduced valve prices.

THE CHLORIDE ELECTRICAL STORAGE CO., LTD., Clifton Junction, Manchester.—A folder and photographic card mentioning the "Exide" batteries used on the "R.33."

THE D.P. BATTERY CO., LTD., Bakewell, Derbyshire.—Two illustrated and priced pamphlets dealing with batteries for public supply and private installations.

MESSRS. WILLIAM MILLS, LTD., Grove Street, Birmingham.—"The Lighter Way," a bound collection of postcards illustrating the many uses to which aluminium castings can be put.

MESSRS. WALTER MCGEE & SON, LTD., Albion Works, Paisley.—A series of pamphlets dealing with the construction of "Emcol" totally-enclosed air-cooled motors and their application to textile machinery and other drives.

MESSRS. A. J. STEVENS & CO. (1914), LTD., Walsall Street, Wolverhampton.—A pamphlet and a "cut-out" advertising "A.J.S." low-loss variable condensers. Priced.

METRO-VICK SUPPLIES, LTD., 4, Central Buildings, Westminster, S.W.1.—Supply List No. 140/15, a comprehensive catalogue of "Cosmos" electric fans. Illustrated and priced. Also a coloured folder dealing with the same subject.

THE STEAM FITTINGS CO., LTD., West Drayton, Middlesex.—A leaflet illustrating examples of the company's draught gauges.

MESSRS. HEYES & CO., LTD., Water-Heyes Electrical Works, Wigan.—A booklet dealing with shaft signal indicators, mining-type switches, telephones, &c.

MESSRS. JAMES GORDON & CO., LTD., Windsor House, Kingsway, W.C.2. A pamphlet containing an illustrated description of the "Massip" steam separator and dryer.

MESSRS. ALFRED HERBERT, LTD., Coventry.—A folder advertising the "Keller" electric flexible shaft grinder.

MESSRS. BARTON & SONS, LTD., Beehive Works, Green Street, Walsall.—A priced and illustrated catalogue of conduits, fittings, and accessories.

PHILIPS LAMPS, LTD., 60, Wilson Street, Finsbury Square, E.C.2.—A price list of gasfilled and vacuum automobile lamps.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—List No. 79, containing illustrations and prices of "Siemens" electric fans. Also List No. Z106, advertising single- and double-pole switches for radio installations.

MESSRS. SIEMENS BROS. & Co., LTD., Woolwich, S.E.18.—Catalogue 190, containing full details of "Stannos" wires and wiring fittings. Illustrated and priced.

MESSRS. E. P. ALLAM & Co., 107-109, Gray's Inn Road, W.C.1.—Monthly stock list of electric motors for sale or hire.

MESSRS. BAKER, PERKINS, LTD., Hythe Road, Willesden, N.W.10.—An illustrated brochure dealing with the firm's patent speed gears and their applications.

Book Notices.—"Radio-Lexikon," pp. 259; 20 figs.—This lexicon gives meanings in English, French, Italian, Spanish, and German, and in order to decrease the bulk of what would otherwise be a voluminous volume, the international language "Ido" is used as a key. It is, however, not necessary for readers to possess any prior knowledge of this language, and they can make use of the work forthwith. All that is necessary is to look for the desired word in the index, and the "Ido" equivalent can then be turned up in the lexicon, and under it will be found the exact equivalent in the five languages above referred to. The book includes a series of tables of value to all interested in radio, whether amateurs or professionals. It is a useful work in a handy compass. Its price is 3s. 6d., plus 3d. postage, and it is published by Frederick H. Burgess, 18-21, Charterhouse Square, E.C.1.

"Electricity and the Structure of Matter," by L. Southerns. Pp. 128; figs. 33. London: Oxford University Press. Price 2s. 6d. net.

"Text-book of Wireless Telegraphy and Telephony," by W. Greenwood. Pp. vii+265; figs. 201. London: University Tutorial Press, Ltd. Price 5s. 6d.

Scientific Papers of the Institute of Physical and Chemical Research, Komagome, Hongo, Tokyo.—No. 19, "The Formation of a New Dioxydiphenyl from Rescorin"; No. 20, "Further Study on the Accumulation of Charge on Dielectrics and Conductors in Contact with Dielectrics"; No. 21, "Effect of Temperature on the Deterioration of Fibrous Insulating Materials"; Nos. 22-23, "The Transformation Temperature of Thallium."

"Practical D.C. Armature Winding," by L. Wollison. Pp. xii + 228; figs. 152. London: Sir Isaac Pitman & Sons, Ltd. Price 7s. 6d. net.

The Protection of the Steel Industry.—According to the daily Press, a hint that the protection of the iron and steel industry would receive favourable consideration was given by the President of the Board of Trade at the recent luncheon of the National Federation of Iron and Steel Manufacturers. Mr. C. E. Lloyd, the president of the Federation, said that it might become necessary for the industry to take temporary advantage of the protection afforded by the Safeguarding of Industries Act.

Swedish Machinery for Russia.—*Swedish Export* states that Mr. W. Jessen, the representative of the Soviet Government, has placed considerable additional orders with the A.S.E.A. and the Karlstad Works for electrical machinery and water turbines respectively. These machines, which are intended for the electrification of agricultural districts in Russia, are to be delivered during the current year. The amount involved is said to exceed 5 million kroner.

Motors for New Zealand.—The chief engineer of the Manawatu Oroua Power Board, New Zealand, reports that inquiries are being made at present by farmers in the district for electric motors for milking machines. He adds that the last few months have seen a big demand for both motors and water heaters which are now being installed by most of the dairies in the district.

New German Customs Tariff.—The new Customs tariff which has just been brought forward in Germany proposes to make a great differentiation between the import duties on electrical manufactures, while at the same time the rates of the duties have been increased on almost all items and apply to weights of 2 double hundredweight. The duty on dynamos and motors in general, converters, and transformers of small sizes, has been raised from 9 marks per double hundredweight to 80 marks, on larger sizes from 9 marks to 18 marks, and on heavy machines of over 5 tons from 6 marks to 7 marks. Electric heating and cooking apparatus remains as hitherto in so far as large weights are concerned. Duties on telegraph apparatus, telephones, electric measuring, counting and registering apparatus, are increased from 60 marks to 120 marks, and those on Rœntgen tubes and magnetos from 60 to 2,000 marks. The duties on electrical equipment for lighting, the transmission of power, and electrolysis, remain as at present. The rate for electric vehicles for use on rails is advanced from 10 to 13 marks, and upon those for the transport of passengers from 7.5/10 marks to 12/16 marks.

A Russian Radio Exhibition.—An exhibition of radio apparatus is being organised in Moscow. Applications from foreign firms who wish to participate will be accepted up to June 1st. Information may be obtained from the Commercial Information Department of the Trade Delegation of the U.S.S.R., 68, Lincoln's Inn Fields, W.C.2.

For Sale.—Newport (Mon.) Corporation Electricity Department has for disposal one 500-kW cross-compound engine and a triple-expansion pump. The City and County of Bristol Electricity Department invites offers for disused generating plant. (See our advertisement pages to-day.)

A Large Battery Order.—The D.P. Battery Co., Ltd., through its Scottish agents, Messrs. Kelsall & Parsons, Glasgow, has received an order from the Aberdeen Corporation for re-plating the battery at the Ferryhill generating station. The order, which is to the value of £8,000, is for the company's heavy central station type plates and the battery will have a capacity of 2,904 Ah.

Sussex Contractors' Dinner.—The Sussex branch of the Electrical Contractors' Association held its annual dinner at Brighton on May 21st. Mr. H. L. Smith (the chairman), presided, and the guests included Mr. W. Riggs (President of the E.C.A.), Mr. L. G. Tate, M.I.E.E. (the secretary), Mr. Walton (chairman of the Southern Sectional Board), Mr. J. Christie (Brighton), Mr. C. B. Smith (Hove), Mr. R. N. Torpy (Tunbridge Wells), and Mr. G. Porter (Worthing). In replying to the toast of his health, Mr. Riggs made mention of the success which had attended the National Register. In the first twelve months upwards of 50 per cent. of the contractors had put their names on the register. Mr. Tate, in responding to the toast of "The Council and Executive of the Association," said that the membership had increased by over 100 per cent. in the past four years; there were now some 900 firms in the Association.

Egyptian State Railway Tenders.—The *Board of Trade Journal* reproduces a notice which has been published by the Egyptian State Railways, Telegraphs and Telephones Administration with regard to selected lists of tenderers. As the present lists have been in use for a considerable period it is proposed to revise them during the current year. Therefore all firms who wish to be registered, including those on the existing lists, must make application for this purpose to the Administration in Cairo, quoting reference No. 129.45/7, by October 15th next. Among the categories of goods to which the lists apply are electrical materials, boilers, general machinery and machine tools, lifting machinery, lighting materials, signalling material and telegraph and telephone materials.

A Scottish Garden City Scheme.—An announcement appears in our advertisement pages to-day regarding the scheme of Third Garden City, Ltd., to establish a garden city in the vicinity of Glasgow similar to those at Letchworth and Welwyn, where there will be suitable sites for industrial works, housing, &c.

Edinburgh Radio Retailers' Association.—An Edinburgh branch of the Wireless Manufacturers' and Traders' Association has been formed, and at the inaugural meeting consideration was given to a number of matters of interest to the trade. With reference to the reduction in the price of valves the opinion was expressed that the trade, while heartily approving of this, should be compensated for stocks bought at the earlier price. Already 24 retail firms have joined the Association, and Mr. Smith, of the Scottish Radio Centre, George Street, is chairman.

Latin-American Notes.—Our Latin-American correspondent says that in Uruguay, owing to the more liberal concessions granted by the municipalities, electric signs are becoming popular, and this movement is stimulated in Montevideo by the low rates charged for electricity for the purpose.

The cheapness of energy in Chile has also led to an increased use of electric signs. The market is considered promising for signs of a not too expensive character.

Bolivia is making considerable strides in electrical development. A Canadian company has recently purchased the whole of the electric light, power, telephone, and tramway services in the capital, La Paz. The company will have a capital of £1,000,000, and the purchase price is said to be £900,000.

In Brazil, where many large electrical undertakings had to be stopped owing to the Federal Government's inability to enter into financial arrangements for their completion, some of the less-important municipal work is being brought to a finish. Thus the civil authorities of Sao Bento are desirous of entering into an agreement with a company or individual to complete the electrical system of the city which had already been projected and even commenced. At the time of writing no bids or any kind of offer had, however, been received.

Chinese Notes.—The Foochou Electric Co., Ltd., is issuing new stock to the extent of $260,000, bringing its total capitalisation to $1,200,000. The company commenced operations in 1912 and now has a 2,500-kW plant which supplies energy for lighting and utilises the surplus in a number of factories which it has established, including a rice mill, a sawmill, a sugar refinery, and an ice factory. The company has plans for the harnessing of the water power of the Min River which is estimated to amount to 50,000 kW. It is proposed to erect plant at a cost of $2,000,000 to develop 5,000 kW initially.

The Jung Yao Electrical Supply Co. recently opened a business in Peking Road, Shanghai.

Australian Tariff Decisions.—Among the recent decisions of the Commonwealth Customs Commissioners are the following:—Electric furnaces and equipment therefor, for use in the production of steel: free under the British preferential tariff, 5 per cent. under the intermediate tariff, and 10 per cent. under the general tariff. Graphite electrodes for the manufacture or repair of electric furnaces: free, free, 10 per cent. Turbine parts, *viz.*, Mason regulators, motors and switches for speeder gear, Weir reciprocating oil pumps, worms and wheels for governor oil pumps and tachometer drive: free, free, 10 per cent.

Cold Galvanising.—In our last issue (p. 814) we made mention of the "Bianco" process of galvanising in a cold electrolytic bath. Messrs. W. Canning & Co., Ltd., Birmingham, state that their "Ajax" system, which has been in use for 15 years, possesses the same attributes as the system mentioned. The electrolyte employed never needs renewal, except for the addition of water. The solution feeds itself entirely from its anodes, it being only necessary to add zinc salts when the value of solution has to be restored to its original level, as a certain amount is lost in carrying work from the vat. "There is no secret about this process, and full details are readily given."

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from May 20th. In the case of foreign applications, the names and addresses of the British representatives are also given.

Chromalox (lettering and design). No. 449,336. Class 8. Electrical resistances.—Edwin L. Wiegand Co., 422, First Avenue, Pittsburgh, Penn., U.S.A. (Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

Puremax. No. 456,966. Class 8. Instruments and apparatus for use in radio-telegraphy and telephony.—Lee & Churchill, Ltd., 11-12, Finsbury Square, E.C.2.

The Myston (lettering and design). No. 457,767. Class 8. An instrument for the detection of defective sparking plugs on motor cars.—A. R. Smith and G. W. Tansley Leeson, trading in co-partnership, Estcourt, Mile Road, Hook Heath, Woking.

Neutron (lettering and design). No. 457,747. Class 8. Instruments and apparatus for use in radio-telephony.—Neutron, Ltd., Sicilian House, Southampton Row, W.C.1.

Econo. No. 457,619. Class 13. Electric lamps (ordinary).—E. S. Wilson, trading as E. S. Wilson & Co., 24, Hop Exchange, S.E.1.

Ajax. No. 457,701. Class 13. Electric lamps (ordinary).—J. C. Akester, 8, Arthur Street, Monument, E.C.4.

Uranus. No. 457,523. Class 13. Electric lamps and fittings thereof.—Josef Mersing, 81, Seefeldstrasse, Zurich, Switzerland (Hans & Danielsson, 32), St. John Street, E.C.1).

Patent Restoration.—An order has been made restoring Patent No. 172,153 of 1920, granted to F. H. Royce for "Improvements in relation to electrical turning gear, for starting internal combustion engines."

Meeting of Creditors.—INGLEBY & Co., LTD.—A private meeting of creditors was held at the Hotel Metropole on May 25th, when a statement of the position was submitted by the Receiver, Mr. R. E. Starkie.

New Municipal Showrooms.—The Birkenhead Electricity Committee's recommendation for the purchase of premises at Nos. 7 and 9, Grange Road West, for the purpose of an electricity showroom, at a cost of £5,000, has been approved by the Town Council. The adaptation and equipment of the premises will entail an expenditure of £1,000, and application is to be made to the Electricity Commissioners for sanction to borrow £6,000 to cover the cost of the scheme.

Unemployment.—An increase of 3,720 occurred in the registered total of unemployed during the week ended May 11th, the number at that date being 1,184,200, of which 905,500 were men. The increase in the past twelve months has amounted to 158,000.

New Indian Company.—The Sri-Raja Rajeswai Electric Supply Corporation is the name of a new undertaking which has lately been organised at Ramaad, Madras, with a capital of 100,000 rupees.

New Belgian Company.—La Société Gaz et Electricité de Herstal, is the name of a new company lately formed at Herstal, near Liége, with a capital of 4 million francs, to take over the supply of electricity and gas in the town.

Lighting and Power Notes.

Aldershot.—ELECTRICITY IN BULK.—The Town Council has applied to the War Office for an additional bulk supply of electricity, and also for a revision of the present rates for the bulk supply.

Argentina.—HYDRO-ELECTRIC DEVELOPMENT.—The Sociedad Empresa de Luz y Fuerza de Mendoza is establishing a large hydro-electric station to utilise the water power of the River Mendoza. It is expected that the station will be completed and ready for operation early in 1926.

Axminster and Chard.—SPECIAL ORDER.—Application has been made to the Electricity Commissioners by Mr. C. H. B. Prescott-Westcar, of Herne, for a Special Order authorising him to supply electricity in the urban district, and certain parishes in the rural district of Axminster, and in the borough and parish of Chard.

Bedford.—ELECTRICITY EXTENSIONS.—The Town Council has received sanction to a scheme for a new boiler and buildings at a cost of £16,000. The Electricity Committee has recommended extensions to various mains at a cost of £1,175, and provision of e.h.p. mains as follows:—To Ford End Road, £1,200; Ampthill Road boundary, £2,250; Elstow Road, £1,850.

Blackburn.—SPECIAL ORDER.—The Corporation has applied for a Special Order authorising it to extend its area of electricity supply so as to include the parishes of Witton and Livesey.

Bournemouth.—LOAN SANCTIONED.—The Corporation has received sanction to a loan of £5,000 for electricity purposes.

Buckie.—PROPOSED ELECTRICITY SUPPLY.—The Town Council has decided to ask the Duke of Richmond and Gordon if he would be willing to light Buckie with electricity from his station at Fochabers, where the river Spey is used for generating electricity. Fochabers is about seven miles from Buckie.

Burnley.—ELECTRICAL DEVELOPMENT.—The Rosegrove substation is now practically completed. The energy will be transmitted from the central station in Aqueduct Street at a pressure of 6,600 V, although the cable is designed for 33,000 V, and will eventually be used as the trunk main in the scheme for the Mid-Lancashire area. The new sub-station will transform the electricity from 6,600 to 416 and 240 V for small power users and lighting purposes, but in cases of large power users energy will be given at 6,600 V. The Corporation has already entered into a contract with the executors of Col. Hargreaves, colliery proprietors, to supply energy amounting to 350 and 400 h.p. This is expected to be in operation shortly. A number of small works in Rosegrove have applied for a supply.

Canada.—ELECTRICAL DEVELOPMENT.—In the construction budget of the Montreal Light, Heat & Power Company for the current year is included the building of a new station which, it is said, will be the largest sub-station for city distribution on the continent. The station is designed for a capacity of 60,000 kW, and will be divided into four potentially independent sections by concrete walls. The present load in the district which it will serve is 37,000 kW. Provision will be made for delivery to the sub-station of a current of 60,000 V by underground cables from the generating plants. The station will be laid out for a total of eighty distribution feeders radiating to all the central parts of the city.—*Electrical World.*

Chesterfield.—ELECTRICITY EXTENSION.—The Electricity Committee has decided to lay a cable to the Boythorpe housing estate, at an estimated cost of £1,560.

Continental.—STYRIA.—A new hydro-electric station, known as the Teigutschwerke, is approaching completion at Arnstein, near Gratz, for the Styrian Water Power and Electric Co. The power of the Teiguts Falls is being utilised at three points, the total storage capacity formed by the dams amounting to over 11,000 million gallons. The plant at present installed consists of two Francis 15,000-h.p. turbines running at 750 r.p.m. and coupled to 13,000-kVA alternators generating electricity at 5,500 V, which will be stepped up to 60,000 V for transmission to Gratz and to 200,000 V for Western Styria. The new station is the first stage of a scheme to provide every town and village in the country with a supply of electrical energy.

CZECHO-SLOVAKIA.—The scheme for the electrification of Carpathian Ruthenia is reported to have been definitely drawn up. The total outlay will amount to about £184,000, of which two-thirds is to be advanced by the State and the remaining third by the Uzhorod Electricity Works, which will take over the entire plant at a fixed rent for a term of 50 years.

BELGIUM.—At the recent annual meeting of the Société Intercommunale d'Electricité in Brussels, the chairman stated that the demand for electricity from the various distributing concerns drawing supplies from the company's eight power stations was now equal to the increased output which had been provided during the past year, and already it was necessary for the directors to arrange for further extensions. For this purpose it had been decided to increase the capital of the undertaking from 65 to 100 million francs. The output of the various plants at the present time was 50 per cent. larger than that of a year ago, the receipts showing a corresponding increase.

Crewkerne.—ELECTRICITY SUPPLY.—The Urban District Council has given its consent to an application by Mr. E. R. F. Coleberd for a Special Order to supply electricity to the town. Mr. Coleberd proposes to install an overhead system and to supply electricity at 10d. per kWh, with a reduction of 1d. to large consumers.

Darley Dale.—INQUIRY.—A Ministry of Transport inquiry into the application of the Notts. and Derbyshire Electric Power Co. for powers to supply electricity in the Darley Dale area was held recently. Mr. Wallis, for the company, said that the proposed cable would be brought from Matlock, a distance of over three miles. Part would be underground and part overhead, the cost being £4,950 for the overhead line and £7,850 for the underground cable. The local Councils had joined in opposition mainly because of the overhead route, holding that the line would spoil the beauty of the locality and would be a source of danger in storms. Mr. Phillips, manager of the company, claimed that the overhead line would not be unsightly. He had considered the question of laying the cable underground, but the cost was heavier than for overhead cables.

Greasborough (Yorks.).—ELECTRICITY FOR SMALL HOUSES.—The Urban District Council has decided to install electricity in thirty houses which it is erecting on the Potter Hill site.

Guisborough.—PROPOSED ELECTRICITY SCHEME.—A scheme is on foot for introducing electric lighting at Danby. The Rural District Council has decided to obtain particulars of the scheme together with a plan of the proposed generating station.

Kendal.—ELECTRICITY IN BULK.—Messrs. Merz & McLellan, engaged by the Town Council to report on the development of the electricity undertaking, have presented a report recommending an agreement with Cropper & Co. for a bulk supply of electricity from the firm's power station at Burneside, starting with a demand up to 150 kW, with powers to increase this to 300 kW. The estimated cost of the scheme is £8,357.

Leicester.—INQUIRY.—Evidence has been taken at an inquiry held by the Ministry of Transport into an appeal by the Corporation of Leicester against an Order authorising the Leicestershire and Warwickshire Electric Power Co. to supply electricity in the districts of Anstey, Wanlip, Barkby, and Syston. The Corporation claimed that it was in a better position to supply electricity than the company, and could supply Anstey at half the cost of a supply by the company, and Syston at two-thirds the cost. It was complained that the Commissioners had ignored the East Midland Advisory Board and had dispensed with the consent of the local authorities. The company urged that it was in a position to supply almost immediately and that it could advantageously develop the villages and the territory between them and Coalville. The Corporation had had no experience of supplying small outlying places. The cost of distribution would be five times greater in Syston than in Leicester. The Ministry's decision will be given in due course.

London.—HACKNEY.—The Electricity Committee has recommended that the following extensions be carried out at the electricity works:—One 10,000-kW turbo-alternator, £26,300; condensing plant, £8,655; new pipework and pipe alterations, £2,000; switchgear and connections, £10,000; building and foundations for 10,000-kW set, 1,500-kW converter, &c., £7,000. The Finance Committee has recommended that application be made for sanction to the borrowing of £55,000 to cover the cost of the extensions.

Paisley.—STREET LIGHTING.—Mr. Blair Smith, Corporation electrical engineer, has suggested that overhead wires might with advantage be used for street lighting connections in various streets and so save opening up the roads. The Town Council has authorised him to use overhead wires where practicable.

Plymouth.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking for the year ended March 31st last, show a gross surplus of £60,682, and after paying sinking fund charges and income tax there was a net profit of £21,575, which has been transferred to the reserve fund. Further cable extensions, &c., at a total estimated cost of £6,419, were authorised by the Electricity Committee.

Portsoy (Banff).—PROPOSED ELECTRICITY SCHEME.—The Town Council has decided to obtain a report from an electrical expert as to the cost of introducing electricity in the town.

Preston.—NEW POWER STATION.—The official opening of the Ribble power station, fixed for June 24th, has been postponed until July 22nd. The ceremony will be performed by Sir John Snell, chairman of the Electricity Commissioners.

ELECTRICITY SUPPLY.—The Corporation Electricity Committee has received the approval of the Unemployment Grants Committee to the scheme for laying the Preston portion of the Preston-Blackburn main, with transformers, &c., for the purpose of a grant. The work will commence on June 22nd, and is to be completed within a period of six months.

The Committee has recommended that the electrical engineer be authorised to provide the necessary switchgear for Crown Street sub-station at an estimated cost of £2,209.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

LOWESTOFT.—Lighting: A reduction of ¾d. per kWh.

WALSALL.—Lighting through pre-payment meters: From 7d. to 6d. per kWh.

DUBLIN.—Lighting: Flat rate from 8d. to 7d. per kWh, with special rates for kinemas, theatres, &c. Public lighting: From 2¾d. to 2½d. per kWh.

FELTHAM.—*Egham and Staines Electricity Co., Ltd.*—Lighting: Flat rate from 10d. to 9d. per kWh.

SHREWSBURY.—The percentage increase on pre-war charges to be abolished as from the June quarter meter readings.

Southend-on-Sea.—INQUIRY.—At a meeting of the Town Council on May 19th, the Council adopted a proposal that, in view of the urgent need for more electrical plant to meet the next winter's load, and in order to inquire into the proposals for additional plant about to be installed, the Council should request the Electricity Commissioners to hold a public inquiry at the earliest possible moment.

LOANS SANCTIONED.—The Town Council has received sanction to loans of £30,000 for services and £9,000 for feeders and distributors.

United States.—ELECTRICAL DEVELOPMENT.—According to the *Electrical World*, this year will witness the greatest expansion of public utilities in the history of Iowa. Improvement schemes to cost $50,000,000 are under way to meet demands for service brought about by the resumption of normal business activities. The steam generating capacity of central stations will be more than doubled, and approximately 1,000 miles of h.p. transmission lines will be erected. Three new generating stations alone—those at Des Moines, Davenport and Sioux City—will increase the state's capacity by 200,000 h.p. before the end of the year. The state's present steam capacity is less than 200,000 h.p. The ultimate generating capacity of these three plants will be 465,000 h.p. The territory served from Cedar Rapids is being provided with additional power facilities by the installation of large new units at the present modern generating station, and new h.p. lines are connecting Iowa with generating stations in adjoining states. The electrical engineering department of the Iowa Railroad Commission is preparing projects calling for the erection of hundreds of miles of transmission lines. There are now 8,000 miles of such lines, and it is expected that there will be 9,000 miles before the end of the year. Old lines are being rebuilt. Isolated towns or groups of towns formerly served by small generating stations are being interconnected.

Walsall.—CHANGE-OVER.—The Town Council has sanctioned a further expenditure of £3,000 in connection with the change over of the system of supply from d.c. to a.c.

Tramway and Railway Notes.

Continental.—SPAIN.—Our special correspondent in Spain reports that 80 km. of electrified line between Madrid and Huelves has been completed by the Hidroelectrica Española, which is also building the Molinar-Dos Aguas-Valencia line, and improving that between Valencia and Madrid. By the purchase of the works at Tranco del Lobo, on the Jucar River, the capacity of the central power station in Madrid has been nearly doubled.

GERMANY.—Trials with a new electric locomotive designed for mineral train haulage have recently been carried out on the Hirchberg Gorlitz-Schlauroth railway in Lower Silesia. The engine, which represents a type intended for use on hilly routes, was built by the A.E.G. and the Siemens-Schuckertwerke of Berlin, and is intended for a maximum speed of about 34 miles per hour. The tests showed that the engine can haul coal trains of a total load up to 1,400 tons at a higher average speed than has hitherto been possible.

FRANCE.—According to the report for 1924 of the Société des Chemins de Fer Metropolitain, of Paris, although the work of construction and equipping several new lines of the "Metro" has been continued, no additions to the system were opened last year, the length of line in operation remaining at 57½ miles out of 77 miles for which definite concessions are held. Work on several new sections is, however, well advanced, and it is expected that two new lines will be put in operation before the end of 1925. The company is also carrying out considerable re-organisation work on the existing lines which will enable it to deal with a larger volume of traffic than at present. The Government has also given its approval to the scheme for a second line connecting the main boulevards and for one between the Place de la Republique and the Chatelet.

Glasgow.—TRAMWAY EXTENSION.—The extension of the Corporation tramway to Airdrie was formally inaugurated on May 22nd.

India.—RAILWAY ELECTRIFICATION.—The agent of the Eastern Bengal Railway in Calcutta stated at a recent meeting of the Local Advisory Committee meeting, that a scheme for electrifying the suburban line has given, after examination, good promise of success provided the line is extended to the Central Station in Calcutta. On the Southern Section, the line will be electrified to Budge-Budge and on the Northern Section as far as Mograhat. On the Diamond Harbour line, electrification will be carried out to Kancharapara through Naihati to Bandel and from there to Sealdah. The extension from Sealdah to the Central Station in Calcutta will be an elevated electric line with the station located near Lalbazar.

Leicester.—"COMING OF AGE" CELEBRATIONS.—The "21st birthday" celebrations in connection with the Corporation tramway service took place on May 18th. Decorated cars were placed on each route in the city, bearing many devices and slogans. Members of the City Council, headed by the Mayor and Mayoress, paid a "state" visit to the central depôt, making the journey in decorated tramcars, afterwards visiting the new 'bus depôt. Later the company was entertained at tea. The system was inaugurated on May 18th, 1904, with sixty single deck cars. To-day the system has 178 cars, 163 of them double-deck canopy cars, on twelve routes, and carries over a million passengers weekly.

London.—LIVERPOOL STREET STATION.—A third escalator was put into service, on May 19th, at Liverpool Street station on the Central London Railway. This will supplement the two existing escalators which now cater for the traffic to and from the L.N.E.R. main line station. The new moving stairway will be of "Comb" type. The booking accommodation is also being entirely remodelled and the passimeter system will be introduced. Traffic at this station exceeds that of all other stations on the line, 14,000,000 passengers being dealt with annually.

THROUGH-RUNNING.—The Highways Committee of the L.C.C. has been in communication with the West Ham Corporation and the Walthamstow Urban District Council with a view to arranging for through-running of tramcars to Chingford. As a result, draft heads of agreement have been prepared providing for through services to be operated from the Victoria and Albert Docks *via* Leyton to Chingford Mount.

Rotherham.—TRACK RENEWALS.—The Tramways Committee is considering the relaying of the tramway track between Templeborough and Tinsley.

United States.—RAILWAY ELECTRIFICATION.—According to the *Electric Railway Journal*, the electrification of 30 miles of main line of the Great Northern Railway, extending over the summit of the Cascade Mountains in Washington, is to be proceeded with immediately. The estimated cost of equipment for the new line is $1,000,000, and orders will be placed for four electric locomotives. Power will be obtained from the company's water power plant on the Wenatchee River. The Great Northern's electrification will extend from Skykomish, on the west side of the Cascades, to Verne, on the east side.

Telegraph and Telephone Notes.

Germany.—TELEPHONES ON TRAINS.—The work of fitting the German railways with a telephone service on fast trains is so advanced that trains between Berlin and Hamburg will open the service in June. It is expected that the line Berlin-Nürnberg-Munich will also be in operation in time for the opening of the traffic exhibition at Munich next month. This is the first time that a telephone service has been set up for public use on railway trains, and the charges are but slightly higher than those for the ordinary telephone service. It will be possible from any train provided with the necessary instruments to speak to any telephone subscriber in Germany. It is reckoned that on an average of from 15 to 20 conversations or dispatched telegrams per hour the service will be immediately remunerative.—*Financial Times.*

Imperial Wireless Committee.—AUSTRALIA'S REPRESENTATIVES.—Mr. Bruce, Prime Minister of Australia, announced on May 21st, says the *Morning Post*, that Mr. Mason Allard, a member of the Australian Wireless Board, and the High Commissioner have been appointed Australian representatives on the Imperial Wireless Committee. Mr. Allard was to leave immediately for London. Mr. Bruce's action was taken promptly, following cabled reports that the British Postmaster-General had stated that the Dominion representatives had not yet been appointed, and had given this as an explanation of the delay. The Federal Government regards the completion of the radio system as of the highest importance.

Japan.—NEW RADIO PLANT.—The radio valve transmitter that has been ordered from the International General Electric Co., U.S.A., by the Japanese Government through Mitsui and Co., will put 80 kilowatts of power into the antenna, and is intended for telegraphic communication between the naval stations of Japan. It operates between frequencies of 15,000 and 43,000 cycles, with maximum efficiency at 24,000 cycles, or on a wavelength of 12,500 metres. It will be possible to send 100 words per minute, and the keying may be done at a point remote from the transmitter.

TELEPHONE RECONSTRUCTION.—The recurrence of earthquakes in Japan last week serves as a reminder that the restoration of the country's telephone system, which was destroyed in the 1923 disaster, will not be finished until the end of 1926, by which date nine automatic exchanges to accommodate 36,000 lines and all the old manual exchanges, which deal with 46,000 lines, will have been completed. According to the *Financial Times*, the automatic equipment is to be manufactured and installed by the Automatic Telephone Co., of Liverpool, while the manual apparatus is in the hands of the Western Electric Co., of London.

Persia.—NEW RADIO STATIONS.—The *Commercial and Industrial Gazette* reports that at the end of May the Weak Current Trust (Russia) will send engineers and workmen to set up a powerful radio station at Teheran (Persia). The material for six radio stations in other districts is already completed, and tests are to be made at once.—*Reuter's Trade Service* (Moscow).

The Telephone Service.—LONDON.—The number of telephone calls made by Londoners each week is rapidly nearing 10,000,000. The 9,000,000 mark was passed some weeks ago, and a recent week's returns showed a total exceeding 9,400,000 on 451,000 telephones.—*The Times.*

Radio Notes.

An Intercepting Station.—An intercepting station, or central listening post, is the latest idea for improving and developing the broadcast services both of Great Britain and of the Continent, says the *Evening News*. It is being erected by the B.B.C. a few miles from Bromley, Kent, and should be working in six weeks' time. No other country has anything of the kind. By the use of a sensitive receiver working on four high-frequency, one detector, and two low-frequency valves, the station will be able to pick up signals from all Continental and many American transmitting stations and will be able to tell if one station is jamming another. By means of direction-finding apparatus, stations at fault will be located, and instructions from Savoy Hill by land line to make the necessary adjustments in wavelength will be passed to the station concerned. The intercepting station will periodically check the wavelengths of all British stations, and it will also be used in future to give British listeners the best of the world's programmes which come within its range. These will be picked up at Bromley and relayed to London by land lines, whence they will be sent to all or any of the stations by the simultaneous broadcasting system.

Licences.—The number of broadcast receiving licences in force on April 30th was approximately 1,350,000, and the revenue collected from January 1st to April 30th was £268,000. On this basis Major G. Murray, of the B.B. Co., estimates an audience of 10 millions, and he foreshadows that within the next six months London will be given four simultaneous services.

London's Emergency Station.—OLD PLANT RESTORED.—The broadcast transmitting apparatus at Marconi House (the old transmitting station of 2LO) has been re-established and will remain constantly ready to function as a precautionary measure, in case of any breakdown at the Oxford Street station. In 18 months, representing 75,000 hours of transmission, there have been only three breakdowns of the apparatus, two of which occurred in a period of ten days.

London Studio Improvements.—NEW ROOMS.—A new large studio, which will be suitably draped to produce varying degrees of echo as required, is nearing completion at 2LO. Two new rehearsal rooms, which will also be used as studios when necessary, are being provided, while a special room is being set aside for "talks." Special attention has been given to the ventilation of the new studios, both with a view to efficiency and the exclusion of unwanted noises, and according to the *Evening News*, a centrally-controlled plant is being installed in the basement.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

Open.

Argentina.—An agreement has been concluded between the National Sanitary Works Department and the municipality of Mar-del-Plata for the construction of a large central electrical power plant, with extensions to Mar-de-Plata. The electrical equipment contract includes the provision of a steam turbine and a 600-kW generator, with exciters, surface condensers, and auxiliary pumps, switchboard, four tubular boilers, economisers, ventilators for forced draught, pipes, valves, cables, &c. Particulars are being prepared, and tenders will be called for shortly.—*Reuter's Trade Service* (Buenos Aires).

Australia.—HOBART.—June 30th. Tasmanian Hydro-Electric Department. Material for and erection of an 88,000-V transmission line of 59 miles from Waddamanna to Railton.

MELBOURNE.—July 1st. Victoria Railways. Electric cable.

Belgium.—June 17th. Société Nationale des Chemins de Fer Vicinaux, 14, Rue de la Science, Brussels. H.p. underground electric cables in connection with the electrification of the Brussels-Ninove local railway. Particulars for 3 fr. from the Bureaux des Services Electriques, 48, Rue Montoyer, Brussels.

August 5th. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Telephone exchange equipment for Namur. Particulars (Cahier des Charges Special No. 3-107) for 8 fr.

Bredbury.—Bredbury and Romiley Urban District Council. Transformers and switchgear. (May 22nd.)

Bristol.—June 16th. Electricity Department. One 1,000-kW rotary or motor-converter. (May 22nd.)

Darlington.—June 4th. Board of Guardians. Electric lighting installation at Feetham Poor Law Institution. Specifications, &c., from Mr. A. J. Shaw, clerk to Board of Guardians, Union Offices, Darlington.

East Ham.—June 13th. Education Committee. Installing electric light, Hartley Avenue and Sandringham Road schools. Mr. F. R. Thompson, secretary. (Returnable deposit of 10s.)

Hull.—June 18th. Electricity Department. Two 7,000-kW turbo-alternators and condensing plant. (See this issue.)

India.—June 9th. India Store Department. Three 120-kW, d.c., direct-coupled Belliss generating sets; 100-kW rotary converters, with transformers and starting gear. (May 22nd.)

June 23rd. Six electric Scotch derrick cranes, 25 and 10 tons.

Inverkeithing.—Town Council. Electric lighting installation in connection with the housing scheme. Mr. P. Reid, architect, Park House, Inverkeithing.

London. — HOLBORN. — June 10th. Board of Guardians. Electrical installation at the hospital, Archway Road, N. (May 22nd.)

HAMMERSMITH.—June 12th. Electricity Department. One water-tube boiler, with mechanical stoker, feed pump, piping, &c.; two centrifugal pumps, strainers, valves, pipework, &c. (May 22nd.)

WESTMINSTER.—June 17th. Board of Guardians. Supply of 21 British Ericsson auto-reset-type 25-line telephone instruments or other approved instruments at the Board's offices. Mr. W. J. Lickey, clerk to the Guardians, Guardians' Offices, Princes Row, S.W.1.

Manchester.—June 9th. Electricity Committee. Stores required during the 12 months ending June 30th, 1926. Forms of tender from Mr. S. L. Pearce, manager, Electricity Department, Town Hall.

June 12th. Cable required during 12 months ending June 30th, 1926. Specification and forms of tender from Mr. S. L. Pearce, manager, Electricity Department, Town Hall.

June 16th. Cast or wrought steel pipes and flanges, Stuart Street station; centrifugal oil purifier, Barton power station. (See this issue.)

New Zealand.—NAPIER.—August 10th. Harbour Board. Two electric capstans, electric portable crane, &c.*

Sheffield.—June 5th. Education Committee. Electric wiring and fittings at Abbeydale, Attercliffe, Carbrook, and Walkly Council schools. Specifications from Mr. F. E. P. Edwards, city architect, Town Hall.

Sleaford.—June 12th. Electricity Department. Two 300-b.h.p. crude oil engines with auxiliaries; two 200-kW d.c. generators; one 2-ton hand-operated overhead crane; switchboard and switchgear. (May 22nd.)

South Africa.—JOHANNESBURG.—Municipal Council. June 20th. 6,600-V cable.*

PRETORIA.—June 17th. Union Tender Board. Supply of wireless telegraph equipment for wireless stations at Pretoria and Salisbury, Southern Rhodesia. Specifications and forms of tender from the Controller of Stores, G.P.O., Pretoria.

CAPE TOWN.—June 22nd. Electricity Department. Pole line hardware, insulators, bare copper wire, tubular poles and insulated wire.*

Southend-on-Sea.—Light Railways and Electricity Department. Traction storage battery. (See this issue.)

Spain.—SANTANDER.—June 20th. Junta de Obras del Puerto de Santander. Three goliath cranes.—*Reuter's Trade Service* (Madrid).

Spalding.—Urban District Council. Electricity generating plant, mains, transformers and meters. (May 15th.)

Staffordshire.—The County Council General Purposes Committee has decided to invite tenders for the electric lighting of the proposed new county laboratory buildings.

Stoke-on-Trent.—June 9th. Electricity Department. L.p. switchgear. (May 22nd.)

Switzerland.—June 13th. General Direction of the Swiss Federal Railways in Berne. 18,600-h.p. turbine and a 14,000-kVA, three-phase alternator at the Vernayaz hydro-electric power station. Particulars, for 10 fr., from the Abteilung fur Elektrifikation, Zimmer No. 161, Dients Gebaude, Bruckfeld, Berne.

Turkey.—STAMBOUL.—July 7th. Posts and Telegraphs. 365 tons of iron wire, 2 tons brass wire, and 5,000 copper couplings.*

Walthamstow.—June 15th. Education Committee. Electric lighting installation at the Selwyn Avenue school, Highams Park. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Amersham.—Board of Guardians. Accepted:—
Wiring and fitting the Institution (£375).—Chesham Electric Light Co. Fourteen tenders were received, varying from £495 to £1,380.

Argentina.—BUENOS AIRES.—Department of Sanitary Works. Accepted:—
Machinery for the hydro-electric station to supply power in connection with the construction of a tunnel through the Pre-Cordillera, consisting of three 500-h.p. horizontal turbines (Pelton wheel type), three 330-kW, 3-phase electric generators, switchboard, pipes, valves and accessories ($69,545 paper).—Cia Sudamericana S.K.F. (Sweden)).—*Review of the River Plate.*

Australia.—MELBOURNE.—City Council. Recommended:—
10,000 yd. fibre conduit (£1,089).—Western Electric Co. (Aust.), Ltd.
One 2,000-kW motor-converter, with spares and motor starter (£5,831).—Metropolitan-Vickers Electrical Co., Ltd.
A.c. switchgear (£443).—Ferguson, Pailin, Ltd.
D.c. switchgear (£2,280).—Tombs & Howcroft Pty., Ltd.—*Tenders.*

Belgium.—Manufacturers in seven countries—Belgium, Italy, France, Holland, Denmark, Germany, and England (British Insulated & Helsby Cables, Ltd.)—submitted tenders last week to the municipal authorities of Saint Gilles, Brussels, for the supply of armoured and bare copper cables. The quotations ranged from 512,659 to 616,333 fr., the lowest being that of the Société des Ateliers de Constructions Electriques de Charleroi.

Boston.—Town Council. Recommended:—
Wiring assembly rooms (£127).—J. & S. Fair, Ltd.

Belfast.—Harbour Commissioners. Accepted:—
Electrically-driven travelling crane.—J. Carrick & Sons, Ltd.

Bradford.—Town Council. Accepted:—
Installation of electric lighting at Feversham Street School (£87), and at Thornbury School (£136).—Mr. J. Spaner.

Darlington.—With further reference to our note on page 742, "Contracts Closed," the Darlington Town Council has accepted Messrs. Clough Smith & Co.'s tender for 20 Straker-Clough single-deck trolley omnibuses, and for the reconstruction of the overhead equipment of the tramways. The amount of the contract is approximately £40,000.

Dewsbury.—Corporation. Accepted:—
Motor-converter, &c. (£3,738).—Bruce Peebles & Co., Ltd.

Government Contracts.—The following Government Contracts were placed during April, 1925:—

ADMIRALTY CONTRACT AND PURCHASE DEPARTMENT.
Motor-alternators.—W. Mackie & Co.; Newton Bros. (Derby), Ltd.
Condensers.—Telegraph Condenser Co., Ltd.; British Insulated & Helsby Cables, Ltd.
Electric battery fittings.—Tudor Accumulator Co., Ltd.
Electric generator.—Mather & Platt, Ltd.
Lamp fittings.—Oliver-Pell Control, Ltd.
Incandescent lamps.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.
Motor-generators.—Newton Bros. (Derby), Ltd.
Switches.—Hawkers, Ltd.; Drake & Gorham, Ltd.; Edison Swan Electric Co., Ltd.; Player & Mitchell, Ltd.; W. McGeoch & Co., Ltd.; L. Weekes, Ltd.; Wandsworth Electrical Co., Ltd.

WAR OFFICE.
Accumulators.—J. Lucas, Ltd.
Electric cable.—India Rubber, Gutta Percha & Telegraph Works Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.
Electric generators.—Rees Roturbo Manufacturing Co., Ltd.
W.T. valves.—British Thomson-Houston Co., Ltd.; A. C. Cossor, Ltd.; Edison Swan Electric Co., Ltd.; Mullard Radio Valve Co., Ltd.

AIR MINISTRY.
Alternators and transformers.—Newton Bros. (Derby), Ltd.
Voltage control boxes.—Pyne Manufacturing Co., Ltd.
Flood light.—Chance Bros., Ltd.
Transmitters.—Gambrell Bros.

POST OFFICE.
Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; British L.M. Ericsson Mfg. Co., Ltd.; General Electric Co., Ltd.; Siemens Bros. and Co., Ltd.; Sterling Telephone & Electric Co., Ltd.; Telegraph Condenser Co., Ltd.; Western Electric Co., Ltd.
Testing and protective apparatus.—T. O. Bitake; Phœnix Telephone and Electric Works, Ltd.; M. W. Woods.
Wireless apparatus.—Western Electric Co., Ltd.
Cable (various).—B. I. & H. Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Glover & Co., Ltd.; Macintosh Cable Co., Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.
Dry cells.—Ever Ready Co. (Great Britain), Ltd.; General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.
Parts for secondary cells.—D.P. Battery Co., Ltd.
Loading coils.—Western Electric Co., Ltd.
Ducts.—Doulton & Co., Ltd.; Ensor & Co., Ltd.; Hepworth Iron Co., Ltd.; H. R. Mansfield, Ltd.; Mountford, Phillips & Co. (1920), Ltd.; J. Oakes & Co. (Ridding Collieries), Ltd.; Oates & Green, Ltd.; Robinson & Dowler, Ltd.; Sutton & Co. (Overseal), Ltd.; J. H. Turner & Lisney, Ltd.; J. Woodward, Ltd.
Electric light fittings.—Edison Swan Electric Co., Ltd.
Enamelled copper wire.—Concordia Electric Wire Co., Ltd.
Manufacture, supply, drawing-in and jointing cable.—Guildford-Leatherhead: Pirelli-General Cable Works, Ltd. Holborn-Victoria Junction, mechanical tandem exchange—Ealing, and Newark-Lincoln: Western Electric Co., Ltd. Cambridge-Newmarket: Johnson & Phillips, Ltd. Gosforth-Morpeth, Darlington-Bishop Auckland: Siemens Bros. and Co., Ltd.
Private branch telephone exchange equipment.—Co-operative Wholesale Society, Ltd. (E.C.); Wallpaper Manufacturers, Ltd. (Darwen); London Express Newspaper, Ltd. (E.C.); Crosse & Blackwell Mfg. Co., Ltd. (W.): Relay Automatic Telephone Co., Ltd.
Telephone exchange equipment.—Bishopsgate: Automatic Telephone Mfg. Co., Ltd.
Water-cooling plants.—G.P.O. West: Sturtevant Engineering Co., Ltd.

CROWN AGENTS FOR THE COLONIES.
Cable.—Hooper's Telegraph & India Rubber Works, Ltd.
Telephone apparatus.—Siemens Bros. & Co., Ltd.
Telephone cable.—Pirelli-General Cable Works, Ltd.
Telephones, &c.—British L.M. Ericsson Mfg. Co., Ltd.

Horwich.—District Council. Accepted:—
Underground cable, &c., to the Tup Row pumping station (£2,000).—British Insulated & Helsby Cables, Ltd.

Hornsey.—Town Council. Accepted:—
Cooling tower (£1,415).—Premier Cooler & Engineering Co., Ltd.

Irish Free State.—Contracts placed by the Department of Posts and Telegraphs during April, 1925:—
Bell sets and generators.—Peel-Conner Telephone Works.
Twin cable.—F. Routledge.
Leclanché cells.—Siemens Bros. & Co., Ltd.; General Electric Co., Ltd.
Copper wire.—M. Coquantin.
Switchboard jacks.—British L. M. Ericsson Manufacturing Co., Ltd.
Protectors.—Phœnix Telephone and Electric Works, Ltd.
Relays.—International Electric Co., Ltd.; Sterling Telephone and Electric Co., Ltd.
Repeating coils.—Western Electric Co., Ltd.
Bells, indicators, and jacks.—Phœnix Telephone and Electric Works, Ltd.
Switchboard cords.—British Insulated and Helsby Cables, Ltd.; Western Electric Co., Ltd.; Siemens Bros. & Co., Ltd.
Switchboard plugs.—British L. M. Ericsson Manufacturing Co., Ltd.

DUBLIN.—City Commissioners. Accepted:—
15 coal-consumption meters (£542), for Pigeon House electricity station.—Lea Recorder Co., Ltd.

London.—HAMMERSMITH.—Electricity Committee. Recommended:—
New grab for crane (£115).—Priestman Bros., Ltd.
Cyclone collector for powdered fuel plant (£141).—A. & B. Harris, Ltd.

ST. PANCRAS.—Electricity Committee. Recommended:—
Coal-carrying plant (£2,400).—Underfeed Stoker Co., Ltd.

METROPOLITAN ASYLUMS BOARD.—Recommended:—
Electric generating plant at hospital, Leavesden:—

G. N. Haden & Sons, Ltd. (Recommended.)	**£2,194**
General Electric Co., Ltd.	2,207
V. G. Middleton & Co., Ltd.	2,350
J. Howden & Co., Ltd.	2,410
T. Clarke & Co., Ltd.	2,420
Electrical Installations, Ltd.	2,477
Tov & Winslow	2,495
City Electrical Co.	2,530
Read & Partners, Ltd.	2,544
A. Higginbotham & Sons	2,650
J. W. Russell	2,760
Tredegars (1923), Ltd.	2,786
Drake & Gorham, Ltd.	2,815
Biggs & Samson	3,133

HACKNEY.—**Electricity Committee.** Recommended:—
One 10,000-kW turbo-alternator (£26,300).—C. A. Parsons & Co., Ltd.
Condensing plant (£8,655).—Hick, Hargreaves & Co., Ltd.

ST. MARYLEBONE.—Electric Supply Committee. Recommended:—
E.h.p. cables for 12 months.—British Insulated & Helsby Cables, Ltd.
L.p. cables for 12 months.—Enfield Cable Works, Ltd.
Reblading one of the 3,500-kW "Oerlikon" sets (£747).—Oerlikon, Ltd.

BATTERSEA.—Electricity Committee. Accepted:—
Switchgear for Lavender Hill sub-station (£5,175).—General Electric Co., Ltd.

Lamp Contracts.—Contracts for "Cosmos" electric lamps have been placed by the London, Midland & Scottish Railway Co. and the London Electric Railway with Metro-Vick Supplies, Ltd.

Preston.—Electricity Committee. Recommended:—
E.h.p. cubicles, &c., in connection with a bulk supply to Leyland and other districts, and Preston to Blackburn main (£3,947).—Metropolitan-Vickers Electrical Co., Ltd.
Rotary converter to Crown Street sub-station (£4,899).—English Electric Co., Ltd.

Southend-on-Sea.—Town Council. Accepted:—
Rail hardening on various sections of the tramways (17s. per yard).—Scholey Construction Co.

Shrewsbury.—Castle Committee. Accepted:—
Electric wiring, Shrewsbury Castle.—W. Thomasson & Co.

South Africa.—JOHANNESBURG.—Municipal Council. Accepted:—
Rewinding stator and rotor of the 3,000-kW turbo-alternator (£1,122).—Hubert Davies & Co., Ltd.
One mile .5 sq. in. 3-core cable, &c. (£2,692); 15 miles l.p. and h.p. cable (£19,976). Telegraph Mfg. Co., Ltd.
50 tramcar motors (£7,900).—Metropolitan-Vickers Electrical Co., Ltd.
Boiler-house equipment (£40,295).—Reunert & Lenz, Ltd.
500 steel tramcar tires (£1,575).—Hadfields, Ltd.
H.p. and l.p. cables (£3,735).—W. T. Henley's (S.A.) Telegraph Works Co., Ltd.
—*S.A. Power Engineer.*

Swansea.—Electricity Committee. Accepted:—
Extending ash-handling plant and coal plant (£1,222 and £1,072).—Ed. Bennis & Co., Ltd.
Steam pipes for new 10,000-kW set (£424).—British Mannesmann Tube Co., Ltd.

Forthcoming Events.

Institution of Electrical Engineers.—WIRELESS SECTION.—Wednesday, June 3rd. At the Institution, Victoria Embankment, W.C. At 6 p.m. Paper on "The Effect of Wave Damping in Radio Signal Instruments," by Dr. R. L. Smith-Rose.

Royal Institution of Great Britain.—Wednesday, June 3rd. At 21, Albemarle Street, W. At 5.15 p.m. Tyndall Lecture on "The Passage of Electricity Through Vacuum Tubes," by Prof. R. Whiddington. (Lecture III.)

Notes.

The Ether and Relativity.—Soon after Professor Michelson announced the results of his experiments, commented on in a recent issue, which showed that the ether was stationary with regard to the earth at the surface of the earth, Prof. D. C. Miller reported the results of four years' experiments in his laboratory at the top of Mount Wilson to the American National Academy of Science, which indicated that at that height, 5,000 ft. above sea level, there was a "drift" of the ether, a motion relative to the earth at about six miles per second, or one-third of the orbital velocity of the earth.

The experiments conducted by Prof. Michelson in 1887 at the surface of the earth showed that the velocity of light in the direction of the earth's orbital motion was identical with its velocity at right angles to that direction, indicating either that the ether was carried along with the earth, or that matter in motion suffered a contraction in its length in the line of motion, which rendered impossible the measurement of the earth's velocity relative to the ether. The latter alternative was in conformity with electromagnetic theory, as shown by Prof. Lorentz; but Prof. Miller's results point to the former—namely, that the ether is carried along with the earth at its surface, but is less completely entrained at an elevation above that surface. The Einstein theory of relativity requires no ether, so far as its mathematical expression is concerned; but if there is an ether, it must behave in accordance with the Lorentz contraction hypothesis. Prof. Michelson's experiments offered no obstacle to the Einstein theory, for that of 1887 indicated that linear motion through space produced no detectable effect on the velocity of light, whilst the more recent experiment related only to rotational motion, in which the two rays traversed the same path and therefore the Lorentz contraction, if it took place, affected both equally, the result showing that the ether, if it existed, was stationary.

In a letter published in *Nature* of the 23rd inst., Prof. L. Silberstein discussed the subject, stating that Prof. Miller had observed on four occasions a relative velocity of 2 km./sec. at the altitude of the Case School of Applied Science, and a velocity of 3 km./sec. on the level of the neighbouring hills, but at the altitude of the Mount Wilson Observatory in four consecutive experiments he obtained with increasing precision a positive result of 10 km./sec., correct to within ½ km./sec. This result, says the writer, is entirely antagonistic to the Einstein theory. He regards it as in conformity with the Stokes conception of the ether as modified by Planck and Lorentz, and suggests that the Michelson result for rotational motion can be accounted for on the assumption that the globe, being almost perfectly spherical, does not appreciably drag the ether in rotatory motion, its grip on the ether being purely gravitational. Prof. Silberstein also claims to account for the Einstein deflection of light rays passing near the sun by assuming that the ether is compressible.

Educational.—COATBRIDGE.—The Principal of Coatbridge Technical School has intimated to the Education Authority that Messrs. Anderson, Boyes & Co., Ltd., electrical engineers, Motherwell, have generously installed, free of cost to the Authority, a 14¼-in. d.c. chain-skid coal cutter, which, while remaining the property of Messrs. Anderson, Boyes & Co., Ltd., will be at the disposal of the school for instructional purposes. The value of the machine is £550. The Authority expressed appreciation of the gift and the clerk was instructed to thank the firm.

The World's Electricity Consumption.—At the recent annual meeting in Brussels of the Société Financière de Transport et d'Entreprises Industrielles—among the directors of which are Sir Pierre Lacy, Bart., and Sir Edmund Wyldbore Smith—some interesting comments on the world's electricity consumption were made by the president, M. Despret, who mentioned that the progress in the United States was considerably greater than in Europe; the sale of electrical energy in that country during last year reached a total of over £282,000,000, an increase of 5.2 per cent. over 1923 and of nearly 300 per cent. over that of 1914. The American production of electrical energy in 1924 was equal to 443 kWh per inhabitant, as against only 212 kWh per head in Belgium, in which country last year's production amounted to 1,651 million kWh. In Great Britain in the year ended March, 1924, the output was 6,682 million kWh, an increase of 16.4 per cent. over 1922-23. In Buenos Aires, Argentina, the output had advanced from 473 million kWh in 1923 to 545 million kWh last year, and the average per inhabitant from 225 to 252 kWh. In Barcelona, Spain, the output had advanced from 443 to 483 million kWh, and in Italy the consumption per inhabitant was now 154 kWh as compared with 140 kWh in 1923. At the present time 23 new power stations were being constructed in Italy, which would increase the output in that country by 2,000 million kWh per year.

Attention was also drawn to the great progress which was being made in the electrical equipment of power stations and in this connection it was mentioned that last year witnessed the inauguration in America of high-pressure turbo-alternators generating 65,000 kVA, transformers of a capacity of 20,000 kVA, and experiments with paper-insulated underground cables capable of transmitting current at 110 000 volts. All such progress was due to a recognition of the necessity of economy in fuel consumption, either coal or oil. Other results were seen in the increasing efficiency of steam engines and turbines. Much, however, remained to be done, and it was satisfactory to know that in all the leading countries research committees were busily at work on the problem of the better utilisation of fuel and the conservation of energy.

Appointments Vacant.—Working electrical engineer, for the Hawarden R.D.C. Junior shift engineer, for the Horsham U.D.C. electricity department. (See our advertisement pages to-day.)

Hydro-Electric Plant in Switzerland.—Tests recently completed at the works of Bell & Cie., at Kriens, near Lucerne, on the new plant intended for the Lungen Lake station, resulted in a maximum efficiency of 90 per cent. being recorded, or 5 per cent. more than the makers guaranteed when undertaking the order, the gain in efficiency being, it is stated, equal to an increased output of 850,000 kWh for the same volume of water passed. The Bell Company has also lately completed two new propeller-type turbines for the Lucerne power station at Obermatt to replace two old turbines that had become almost worn out, their efficiency having fallen to 65 per cent. The new machines are working at 86 per cent. efficiency, the gain in power output for water passed being an important matter in these days of water shortage in Switzerland. Three turbines of a similar type have already been supplied to the Berne municipal station, and two others are in course of construction for the same plant. High production costs in Switzerland are, however, limiting to some extent the work in hand to turbines for Swiss power stations, for while among the foreign orders lately secured are five 2,600-h.p. high-speed turbines for France, on the score of economy, arrangements have had to be made for their construction in the last-named country.

Tramway versus Omnibus.—On May 13th, a deputation from the Municipal Tramways Association visited the Ministry of Transport in connection with the granting of licences for private omnibus service in competition with municipal tramway undertakings, and the withholding of licences for omnibus services from municipal authorities. It is reported that legislation is being considered to deal with these questions.

On the other hand, at a meeting of members of the House of Commons on Tuesday last week, a deputation from the London and Provincial Omnibus Owners' Association (Inc.), placed the views of the proprietors of some 10,000 omnibuses before them, pointing out that if omnibuses were not allowed to enter towns where municipal tramways were in operation, passengers from the outlying districts would have to change, and claiming that in most cases direct competition with municipal tramway services could be avoided. Further, the deputation objected to the licensing of municipal authorities to provide omnibus services outside their boundaries. Objection was also taken to the proposal to abolish the right of appeal in cases where a licence had been refused. After discussion, it was moved that a deputation of members should convey to the Minister of Transport the views expressed by the Association.

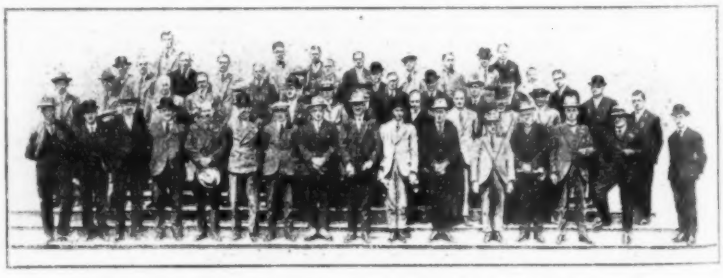
Speaking on this subject in the House of Commons on Thursday last week, Lieut.-Col. W. ASHLEY said that the control of the issue of licences had been transferred to the Ministry, and he was bound to exercise that power in the interest of the general public. Under cover of defending the independence of municipal enterprise certain Labour-Socialist members desired to cut out private enterprise and to prevent independent 'bus services from catering for the benefit of the general public. He was determined to see that the needs of the general public should come before any other consideration, and was not going to favour either municipal or private enterprise.

On the same occasion Col. ASHLEY stated that the only way to reduce the congestion in the London streets was by reducing the number of omnibuses, and if, on the advice of the Committee, he found it necessary to do so, he hoped to have the support of the House.

Speaking as a member of the London Traffic Advisory Committee, Sir H. JACKSON said it had come to the conclusion that the tramways were a vital necessity to London. Whilst the accounts last year showed a heavy loss, the day would come when they would be paying concerns. But there would have to be some restriction of the number of 'buses on the tramway routes.

An E.L.M.A. Illumination Design Course.—Within the last fortnight 51 electrical contractors from all parts of the country attended the Illumination Design Course arranged by the Electric Lamp Manufacturers' Association at its Lighting Service Bureau. The design course was arranged in order to enable those who are responsible for the installation of electric lighting material to be fully cognisant of the most recent advances which have been made in electric lighting.

During the course of the lectures, which were on diverse subjects, it was pointed out that lighting offered almost unlimited prospects of profitable development if it was pursued with knowledge and enterprise. The members attending the design course enthusiastically entered into each of the many aspects of electrical illumination, and the discussions after each of the lectures indicated that lively interest had been aroused. The lecturers were Messrs. W. E. Bush, W. J. Jones, E. S. Evans, F. J. Hawkins, W. Millner, H. Lingard, B. P. Dudding, E. L. Randall, L. E. Buckell, J. N. Stephens, C. W. Sully, C. A. Hughes, H. N. Green, G. P. Garbett, R. C. Hawkins, H. Clifford Palmer, H. Howitt, H. C. Wheat, and W. H. Williams. The lectures covered industrial illumination, domestic installations, shop-window lighting, and many other subjects. During the course the party paid a visit of inspection of the new illumination effects at Wembley, and at the conclusion of the course the visitors were entertained to dinner at the Engineers' Club.



Electrical Contractors who Attended the E.L.M.A. Design Course.

We have received a testimonial, signed by about 50 of the contractors who attended the course, in the following terms:—"We, the undersigned electrical contractors, who have just attended the Fifth Illumination Design Course organised by E.L.M.A., at the Lighting Service Bureau, desire to place on record our appreciation of the high educational value of the same, of the ability and thoroughness with which the lectures dealt with the many and varied subjects and of the excellent arrangements made by, and the capabilities of the officials of the Lighting Service Bureau. We congratulate E.L.M.A. on this service, which we consider the best and most valuable propaganda ever devised for the furtherance of the electric lighting business in this country. We would like to impress upon every member of the E.C.A. the absolute necessity of attending one of these courses at the very earliest, if they are desirous of having their ideas right up to date in connection with the vast possibilities which are now open in our industry. We also desire to thank E.L.M.A. for its generous hospitality during the period of the lectures."

Electricity in Jugo-Slavian Mines.—Work is in hand on the electrification of the three collieries of the Société Uritad in Jugo-Slavia, and by the end of October next it is anticipated that the whole of the plant will be electrically operated.

Electrolytic Disinfecting Fluid.—The report for 1924 of the Medical Officer of Health (Dr. F. W. Alexander) to the Borough of Poplar, states that 70,350 gallons of electrolytic disinfectant fluid were manufactured during 1924, and broken down to 140,700 gallons for distribution. The total cost of materials and electricity was £268, of which £136 was for electrical energy. Since the installation of the plant, a period of 19 years, 819,699 gallons of fluid have been manufactured at a cost of £1,283 for electricity and of £1,575 for materials.

Visit to G.E.C. Laboratories and Works.—On Friday, May 15th, a party of some eighty members of the Birmingham Electric Club journey from Birmingham to London to visit the research laboratories and works of the General Electric Co., Ltd. Leaving Birmingham at 8.40, the party was met at Euston Station and conveyed to the laboratories, Wembley. After inspecting the laboratories, the party was conducted in charabancs to the Clarendon Restaurant at Hammersmith, for lunch.

Mr. C. Wilson, a G.E.C. director, welcomed the visitors and Mr. Shaw, vice-president and ex-president of the Club, thanked the directors and the staff of the G.E.C. for their welcome. In reply to a vote of thanks to the G.E.C., by Mr. Shaw, Mr. Jolly said how pleased he had been to see the visitors at Wembley. If any members of the Club desired to pay another visit to the laboratories, both he and Mr. Paterson would be pleased to welcome them.

The luncheon concluded with musical honours and cheers for the chairman. Afterwards the party was conducted to the G.E.C. lamp and valve works, where they were shown every phase of the manufacture of Osram lamps and valves. Tea was served later in the afternoon.

Safety in Mines Research Board.—The second report of the Explosives in Mines Research Committee has just been issued (H.M. Stationery Office, price 3d. net). It deals with work carried out during the year 1924 at Ardeer, at Eskmeals, and the Safety in Mines Research Board's Laboratories, Sheffield, under the two main headings: Empirical Experiments and Fundamental Research. The former covers investigations in connection with the "gallery" test; the latter deals with the characteristics of the explosive and of the inflammable gas-air and coaldust-air mixtures.

X-ray Exposure Timing Device.—An attack on the white plague is being made with the aid of X-rays. Dr. F. Maurice McPhedran, of the Phipps Institute, is using a new device to take diagnostic X-ray photographs of the lungs. The motion of the heart and lungs during exposure causes a loss of detail, so an electrical engineer at the University of Pennsylvania, Mr. Charles N. Weyl, aided by Dr. McPhedran, has designed apparatus which overcomes this disadvantage. Between successive heart-beats there is a period when the heart is at rest, but this is too brief to permit a fully timed exposure. So, says *Science*, Mr. Weyl makes the exposure in instalments during the intervals between several succeeding beats. A small glass funnel is placed over the artery on the side of the patient's neck, and as the blood rushes through it the pulse formed causes a slight pressure in a rubber tube and acts on a small sheet of rubber, to which is attached a mirror, and a beam of light is reflected to a photo-electric cell. Radio vacuum tubes amplify this current which is used to operate a relay which, in turn, makes the X-ray exposure at the proper moment.

The London Electrical Engineers.—The following is the programme of work for next month of the 27th A.A. Battalion R.E. (T.A.) (London Electrical Engineers), at 46, Regency Street, Westminster, S.W.1:—

304th Company (Major W. H. Merrett, T.D., A.M.I.E.E.).—Mondays, 7 p.m. to 9.30 p.m., H.q., Royal School of Mines and Hyde Park.

305th Company (Major A. W. M. Mawby, O.B.E., A.M.I.E.E.).—Tuesdays, 7 p.m. to 9.30 p.m., H.q., Royal School of Mines and one mobile station.

306th Company (Major F. C. Clarke, A.M.I.E.E.).—Fridays, 7 p.m. to 9.30 p.m., H.q., Hyde Park and Royal School of Mines; 2 officers and detachment of 12 lights at Wembley throughout the month.

Lorry drivers' week-end camp (304th Co.), Whitstable, during the month.

(*Continued on page 863.*)

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The Barking Electric Power Station.

Ceremonial Inauguration by H.M. King George V.

THE County of London Electric Supply Co., Ltd., whose new electricity generating station at Barking was officially inaugurated by the King and Queen on May 19th, commenced its career in 1891. To-day, with its group of associated companies, it serves a population of over 2½ millions and is authorised to supply an area of 275 sq. miles, nearly 80 per cent. of its output being utilised for power purposes. In 1924 the company's gross revenue was £2,381,908, the dividend for the year was 15 per cent., and the total reserves amounted to £3,364,589. The energy generated reached 105,591,032 kWh, and that purchased by the company for resale 115,116,005 kWh; the horse-power connected to the mains was 355,117, and the consumers numbered 62,000. The 100-acre site of the Barking station has a frontage of 2,100 ft. on the River Thames; in addition, an associated company controls 300 adjoining acres which it is intended to let for factory building purposes. The steel-framed brick buildings stand on reinforced-concrete piles, and contain four turbo-alternators, two being composite sets having a capacity of about 50,000 h.p. each, the other two being of 25,000 h.p. each, or a total of six 25,000-kVA generators; they are all of Messrs. C. A. Parsons & Co.'s reaction, 6,600-volt, 3-phase, 50-cycle, 3,000-r.p.m. type (fig. 4).

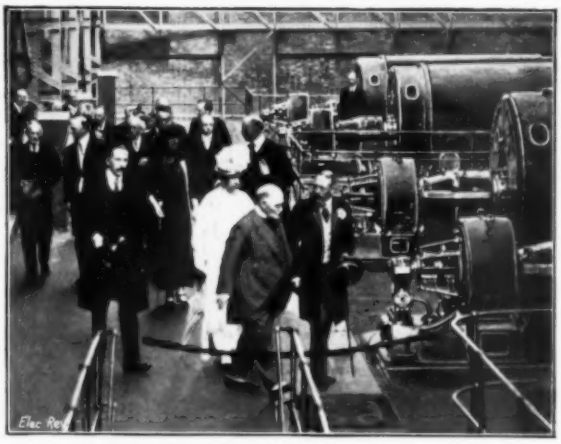


Fig. 1.—The King Inspecting the Station.

Fig. 2.—Main Switch Control Room.

The boiler house (fig. 3) is at right angles to the turbine room, and will accommodate 12 water-tube boilers and four for re-heating the steam during its passage from the high- to the low-pressure stages of the large turbines; this is one of the features of the plant. Each turbine exhausts into a pair of condensers and the condensate is heated before being returned to the boilers; river water is evaporated for the feed make-up. All the condensing plant has been supplied by Messrs. Vickers, Ltd., of Barrow. At present five Babcock & Wilcox and five Yarrow boilers are installed back to back in two parallel lines and operate at a steam pressure of 375 lb. per sq. in., the steam temperature being 700 deg. F. Each boiler has two chain-grate stokers, fed from overhead coal bunkers, and for the guidance of the combustion engineer a complete set of instruments has been provided.

The main switches are divided, the gear being housed in two separate buildings; each Reyrolle ironclad switch is capable of interrupting 2,000,000 h.p., and is operated by push buttons from the control room (fig. 2). The main transformers are housed in chambers along one side of the engine room; they raise the pressure from 6,600 to 33,000 volts, at which pressure all switching is carried out. One group of 3-core, 33,000-V cables carries the electricity generated north of the River Thames to a sub-station at City Road, another group will cross under the river through a tunnel that is now being driven, while a third and interconnecting cable passes through the Rotherhithe Tunnel.

The river channel has been dredged and a jetty built which will permit ocean-going ships to discharge their cargoes at all states of the tide; thus, the 4,000 tons of coal the present section of the station will need per week can be delivered direct from the coaling ports. Two jetty cranes, each capable of grabbing coal from a vessel at the rate of 200 tons per hour, deposit the fuel on a series of belt conveyors that deliver it either into the filler pits, whence it is elevated by gravity bucket conveyors to the bunkers, or to the storage areas, which are served by railway sidings, and

Fig. 3.—Boiler House.

across one of which is a 200-ft. span movable bridge carrying a jib crane, grab, and conveyors. Conveyors are also provided for handling the ashes, which later on will be loaded into barges and dumped at sea.

Chambers cut out of the river bank below the water level contain the six electrically-driven centrifugal pumps and revolving screens that will provide the 400 tons of water per minute needed by the condensers.

Messrs. Merz & McLellan are the company's consulting engineers, Mr. A. R. Bacon being the chief station engineer, Mr. J. D. Dallas the chief mains engineer, and Mr. J. Vice the resident engineer. It is claimed that the capital cost per h.p. of the Barking station is below that of any other post-war plant of comparable size, and it is understood that a thermal efficiency of 24 per cent. and a consumption of 1.5 lb. of coal per kWh are being aimed at. The whole of the equipment is of British manufacture, and the total cost of the power house, mains, &c., is £2,500,000, while 10,000 men have been employed at Barking. The first section of the station, which it must be remembered is only a part of the whole, is designed to contain 250,000 h.p. of generating plant, the section opened on Tuesday last week being of about half this capacity.

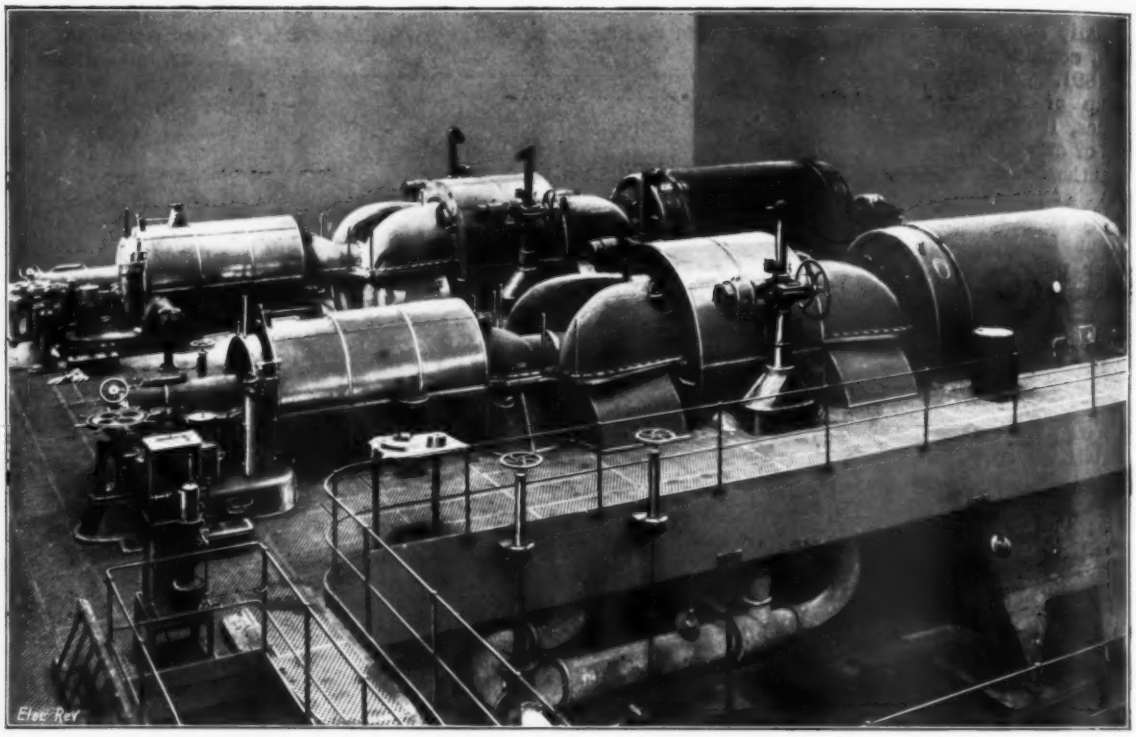


Fig. 4.—Two of the Turbo-generator Sets at the Barking Station.

Electricity Supply at Hastings.

Opening of the Broomgrove Power Station.

Hastings was one of the earliest towns in this country to receive a public supply of electricity, at the hands of a company to which the late Mr. Robert Hammond was consulting engineer; that was in March, 1882, and the original works—purchased by the Corporation in 1898—have been enlarged repeatedly to meet the growing demand. The latest addition was made in 1922, but was recognised also as the last, there being no more room on the site; and the Electricity Commissioners sanctioned the erection of a new power station large enough to give bulk supplies to neighbouring communities on the three-phase system at 50 cycles, which should also replace the single-phase 100-cycle system in operation in Hastings.

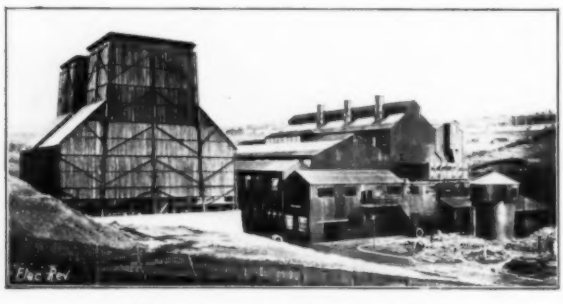


Fig. 1.—Broomgrove Power Station.

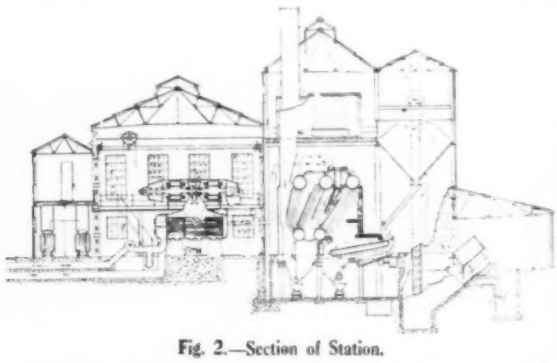


Fig. 2.—Section of Station.

Unfortunately no suitable site on the coast, where sea-water could be used for condensing, was available,

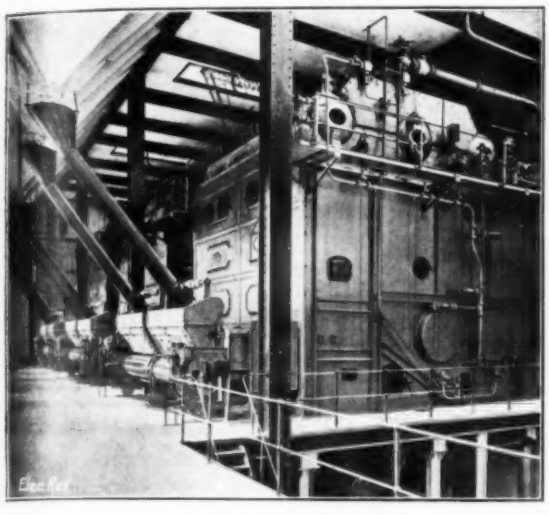


Fig. 3.—Boiler House.

and it was necessary to build an inland station with cooling towers: Broomgrove offered the advantages of railway facilities, and maximum cooling for the towers, being situated in a valley in line with the prevailing winds, with sufficient space to accommodate plant of 50,000 kW. The slope of the site also allowed of the circulating pumps and condensers being always flooded.

The Broomgrove power station was designed by the Borough electrical engineer, Mr. Russell F. Ferguson, M.I.Mech.E., M.I.E.E., who also supervised the work of erection. It is constructed of steel, on concrete foundations, the framework of the walls and roofs being filled in with bitumen-asbestos protected corrugated steel, made by the Wolverhampton Corrugated Iron Co., Ltd. This material is cheaper than brickwork or concrete, has a long life, and does not induce condensation, whilst it is easily removed and cut when necessary.

The building consists of three parallel bays—the coal bunkers, boiler house, and turbine room. The condensers are carried on concrete foundations on the floor level, the turbines resting on them and being surrounded with an operating floor of checker plate. The main switchboards are housed on the top of the transformer room in an annexe alongside of and open to the turbine room. Special attention has been given to the natural lighting of the interiors. Messrs. Fairweather and Ranger were the contractors for all the constructional work, roads, foundations, &c.

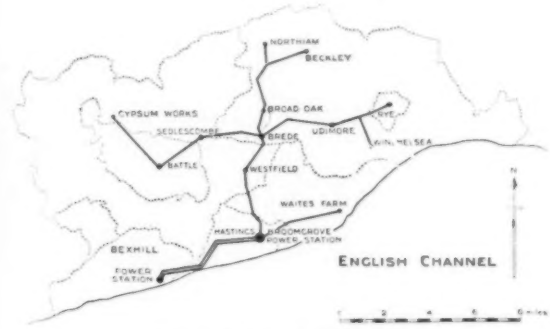


Fig. 5.—Plan of Extended Area.

Coal trucks arriving at the station are hauled up an inclined siding by a Clarke-Chapman electric capstan, with pedal control, over a Pooley weighbridge (which is electrically operated) to a patent gravity wagon tipper designed by Messrs. Aldridge & Ranken, Ltd., who supplied the coal and ash-handling plant; one man can deal with five 10-ton trucks per hour, without the aid of power. Falling into a hopper, the coal is delivered to a bucket-chain elevator and thence carried by a band conveyor to the three coal bunkers, each of which holds 100 tons. A storage yard of 1,000 tons capacity is also provided.

The boiler house contains three Stirling five-drum water-tube boilers, with integral superheaters and chain-grate stokers, and Green economisers, together with induced-draught plant and steel chimneys. The guaranteed efficiency of the boilers is 84 per cent. The economisers and induced-draught plant are carried on a floor above the boilers. Each boiler is rated at 30,000 lb. of steam per hour, at 265 lb. per sq. in., superheated 269 deg. F., with a total temperature of 680 deg. F. A complete equipment of measuring and recording instruments is provided.

The Babcock & Wilcox stokers are driven by Brush motors through a shaft in the basement, and are of the latest type, with traversing coal shoots, and Lea coal meters. Messrs. Davidson & Co., Ltd., supplied the fans.

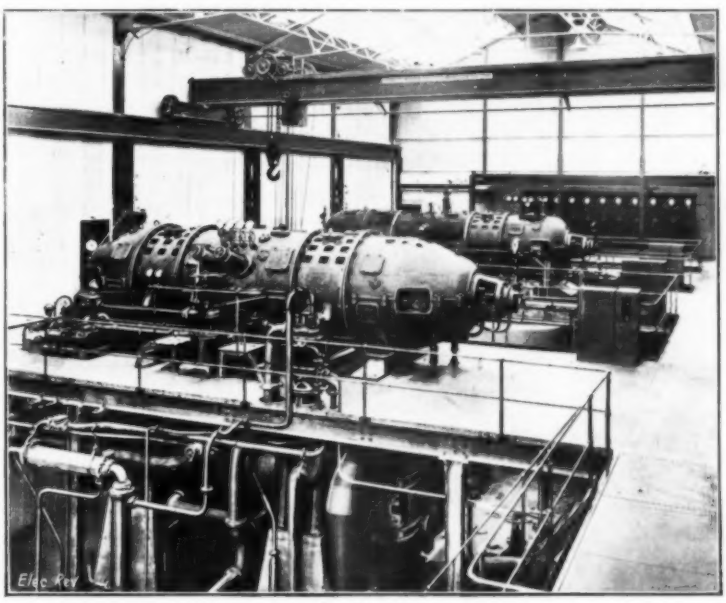


Fig. 4.—Turbine Room.

The ashes fall through hoppers into trucks on rails, which trucks are lifted by a 1-ton Morris electric hoist and carried along a runway to trucks on the siding.

The contractors for the pipe-work and water-handling plant were Messrs. Aiton & Co., Ltd.; water is derived from the town mains and is passed through a Paterson softening plant, capable of dealing with 6,000 gals. per hour. Boiler feed-water make-up is distilled in a Proche & Bouillon evaporator, capable of delivering 2,000 lb. per hour at 212 deg. F., free from gas. From a storage tank of 16,000 gals. capacity the distilled water gravitates to the hot well, which also receives the condensate, and can be fed directly from the softened water supply. Dissolved oxygen is removed from the feed water by a Kestner degasser. There are three feed pumps, two of the Pulsometer turbine type driven by Brush motors, and one a steam-driven pump made by Messrs. J. & P. Hall. Crosby feed-water regulators are installed, with Crosby automatic pump control on the feed main.

The high-pressure steam piping is solid drawn steel tube, with flanges electrically welded on and branches gas-welded. Low-pressure pipes are of lap-welded tubing.

The turbine room contains two Brush Ljungström turbo-alternators, with condensing plant and auxiliaries, supplied by the Brush Electrical Engineering Co., Ltd.; one is of 5,000 and one of 3,000 kW output, and a 1,125-kW single-phase set of the same type, at present running in the old works, will be rebuilt as a 1,500-kW 3-phase set and transferred to Broomgrove station, making the total capacity 9,500 kW. Provision is made for adding a 7,000-kW set. Cooling air is provided by fans through filters of the oil type made by Messrs. Cleworth, Wheal & Co., Ltd. The condenser auxiliaries are Brush-Delas ejectors, Pulsometer extraction pumps, and Drysdale circulating pumps, with Brush motors and Ellison control gear. Crosby oil regulators are provided. Merz-Price protection is provided for the alternators, and operate B.T.H. field suppression switches.

A Herbert Morris 20-ton hand overhead crane serves the turbine room, and has a 3-ton auxiliary hoist.

The cooling towers, supplied by the Premier Cooler and Engineering Co., Ltd., are of the natural draught type, designed to cool 200,000 gals. per hour from 90 to 75 deg. F. The framework is specially rigid on account of the exposed situation; all the iron work is galvanised, and the timber is pressure creosoted. The pond, of ferro-concrete, has a capacity of 217,000 gallons; to avoid heavy excavation due to the contour of the site, it has three depths—3, 6, and 9 ft.

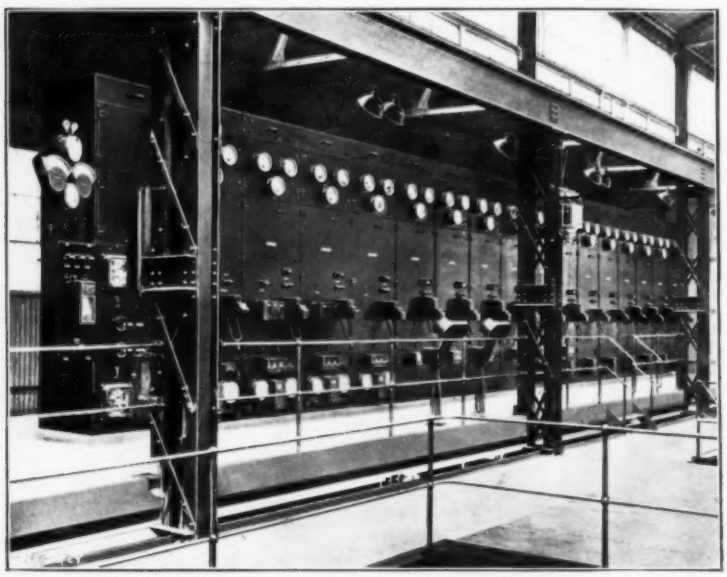


Fig. 7.—Extra-high-pressure Switchboard.

The switchgear has been supplied by Messrs. Ferguson, Pailin, Ltd., and consists of a 6,600-V three-phase switchboard, a 2,200-V two-phase board, and a 400-V power board for the station. All the switchgear is of the metal-enclosed air-insulated type, non-interlocked. The extra-high-pressure board consists of 17 panels, controlling the three alternators, four 1,000-kVA Scott-connected transformer banks, two 250-kW auxiliary works transformers, and two 0.25-sq. in. three-core feeders, with spare panels for a 7,000-kW set and four feeders. The 1,000-kW transformers convert from 6,600 to 2,250 V and feed the two-phase system controlled by the board above-mentioned; and the 250-kW transformers convert from 6,600 to 400 V, three-phase. One panel of the e.h.p. board houses a Brown Boveri automatic pressure regulator for each set. The circuit breakers are oil-immersed in strong welded steel tanks. Those connected with the transformers are provided with buffer resistances, in circuit only during switching operations, to protect the end coils of the transformers from strain. All the power transformers are protected by the self-balance system, and the feeders have overload protection with inverse time element, on each phase. The neutral point of any machine can be earthed through a current limiting resistance.

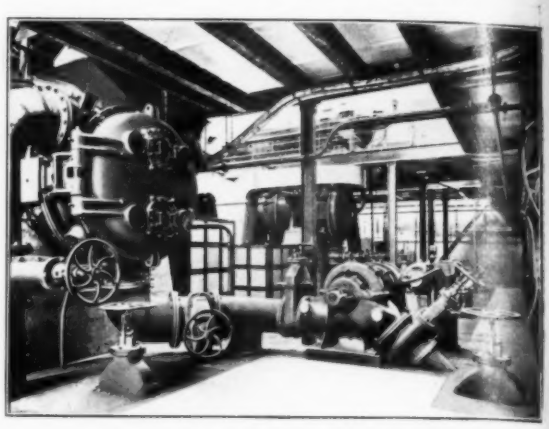


Fig. 6.—Condensing Plant.

The two-phase switchboard also has 17 panels, controlling the two-phase output of the transformers and 12 single-phase feeders. Change-over switches enable each feeder to be supplied from either phase.

An 11-panel board controls the output of the works transformers and nine feeders.

A "central temperature board" in the switchboard annexe is fitted with a "Cambridge" distance thermometer with 56 points, giving indications of temperature of steam, flue gases, and feed water, and of various points on the turbo-alternators and condensing plant. "Electroflow" meters and recorders on this board also indicate, record, and integrate the steam flow from each boiler. The transformers are of Messrs. Ferranti's manufacture, with Ferranti self-balancing protective gear, and are of the oil-immersed self-cooled type. The works cabling

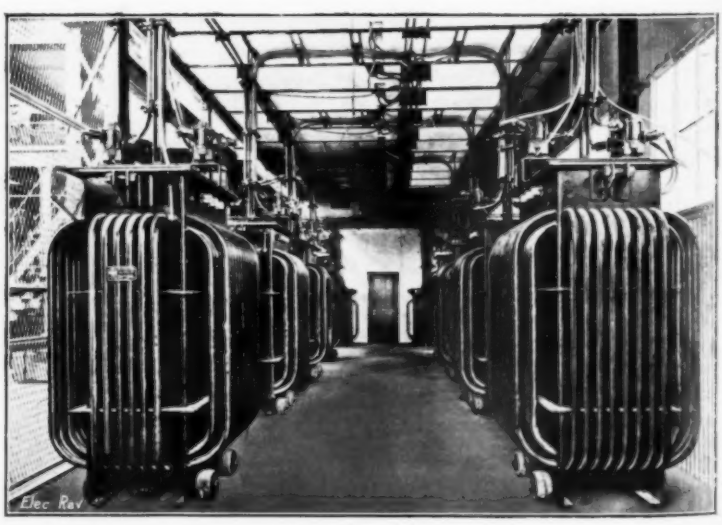


Fig. 8.—Transformers.

was carried out by the Brush Co. An 88-cell Edison battery is installed for emergency lighting, trip gear circuits, and turbine speed control, giving 225 Ah at 100 V. Ten single-phase 2,200-V feeders have been laid from the two-phase switchboard to existing sub-stations and to the old power station in Earl Street, which will be used as a sub-station and distributing centre; the present intention is to supply St. Leonards on one phase and Hastings on the other, as it happens that the two loads are almost exactly equal. The cables are of Messrs. W. T. Glover & Co.'s concentric "Diatrine" type, and are paper insulated, lead-covered, jute served and double steel tape armoured, mostly 0.25 sq. in., but 2,200 yd. is of 0.6 sq. in. cross section. Bexhill is to be supplied at 11,000 V, three-phase, by duplicate 0.15-sq. in. three-core cables of the same type, with the Glover patent test sheath; each cable is 10,655 yd. long. Other parts of the extended area will also be supplied at 11,000 V, from a step-up outdoor sub-station near the power station, partly by overhead and partly by underground cables.

The total capital cost of the power station is estimated at £163,000, or £17.16 per kW at normal rating. When the additional plant is installed, at an estimated cost of £50,000, the cost per kW will fall to £14.12, and the total capacity will be 15,100 kW.

Since 1921 the output of energy has doubled, as well as the maximum demand, and it is rapidly increasing; the charge for lighting is 5½d. to 5d. per kWh, and for power, heating, and cooking 1d. Last year the quantity of energy generated was 3,721,816 kWh, and there were 6,160 consumers.

On Friday last, the new station was opened in the presence of a large gathering, the 5,000-kW set being started by the Mayoress; the Mayor, Ald. W. J. Fellows, J.P., was unfortunately absent through illness.

Luncheon at the Queen's Hotel followed an inspection of the station, the Deputy Mayor, Councillor H. N. Collins, presiding. Prosperity to the electricity undertaking was proposed by Mr. A. D. Thorpe, a director of the gas company; the chairman of the Electricity Committee, Councillor G. H. Payne, responded, and paid a tribute to Mr. Ferguson and his staff, who had borne the strain of running overloaded plant whilst designing and erecting the new station; he hoped that the Council would recognise his fine achievement in a more substantial fashion.

Councillor A. Blackman proposed "The Visitors," and Dr. S. Z. de Ferranti, responding, declared that in his opinion, the new station was just about as good as it could be, according to the knowledge of to-day; he congratulated the ratepayers of Hastings and the surrounding communities on the facilities for the supply of electricity that had been provided by enterprise and good engineering. The low capital cost and the excellent arrangements for the economical working of the new plant were the essentials to success, and the domestic demand would make up for the lack of an industrial load. Mr. J. A. Lee communicated the best wishes of the Electricity Commissioners for the success of the undertaking; the design and layout of the new plant, he said, were admirable. Mr. C. Hill, also responding, received an ovation. Ald. A. Chesterfield proposed "The Contractors," pointing out that the Brush Co. installed the original plant at Hastings; Mr. W. Johnstone, of the Brush Co., and Mr. W. J. S. Mackay, of the Stirling Boiler Co., responded, the latter stating that they aimed at a thermal efficiency of 17 per cent. and a coal consumption of 1.85 lb. per kWh.

All the speakers referred to the high merits of Mr. Ferguson, the borough electrical engineer, and the toast of his health, proposed by the chairman, was given musical honours. In his reply, he thanked Mr. Hill and the present chairman and members of the Electricity Committee and the Council for their support, as well as his chief assistant, Mr. Ryan, his resident engineer, Mr. Saunders, and his technical assistant, Mr. Nye, and the rest of the staff for their good work.

Notes.

(*Continued from page 858.*)

The Reinstating of French Mines.—At the recent annual meeting of the Compagnie des Mines d'Anzin, one of the largest colliery undertakings in Northern France, the directors reported that the work of reinstating the collieries, following the damage done to them during the war, might be regarded as completed. During the past year the last five electric winding engines had been completed. At the company's power station at Thiers the use of coal dust for the firing of the boilers was continuing to give satisfactory results, and a new 10,000-kW turbo-alternator set was in course of installation. The new station replaced a large number of small plants at the different pits and was resulting in marked economy.

The Royal Opening at Barking.—In his address to H.M. the King at the opening ceremony of the Barking power station last week, Sir Harry Renwick, K.B.E., said that, under the general legislation governing electric supply, the association of such enterprises as the County of London Electric Supply Company with neighbouring undertakings was prohibited, but in the London Electricity (No. 1) Bill which was being considered by Parliament provision was made for the closest co-operation between the company and the neighbouring supply companies. The erection of a power house at Barking was decided on by the company many years ago. The constructional work had already afforded employment for large numbers of workmen, and the carrying out of the company's plans would continue to afford a large measure of relief to unemployment for some years to come. The provision of cheap electrical energy would be an invaluable stimulus to London industries and would enable manufacturers to secure increased production at a reduced cost. They were witnessing the transition from the age of steam to the age of electricity and it was universally recognised that a cheap and abundant supply of electrical energy was vital to the progress of an industrial nation. Among the numerous benefits of this fundamental change, not the least would be the improvement of working conditions in factories and workshops, and the gradual elimination of the smoke nuisance.

The wider distribution of electrical energy over the undeveloped areas of Greater London would enable new factories to be placed in the outlying districts where the workpeople could be housed in the healthiest surroundings. By effecting this form of industrial redistribution, cheap electrical energy would result in bringing relief to the inside congested areas and would play an important part in the difficult problem of transportation.

In replying to Sir Harry Renwick's address, the King said the electrical industry was one of our foremost national activities. It intimately concerned our everyday life, affected almost every industrial undertaking and provided the means to improve the conditions in factories and workshops. Hardly less important was the part which electricity was destined to play in transport, in rural life, and in the home. In many of the Dominions, particularly where vast water power was available, electricity had been adopted alike for industry, agriculture, and domestic purposes. In the British Isles the source of power was in our great coalfields; and there seemed to be no insuperable obstacle to the use of electricity on an equally wide scale.

After the ceremony the following presentations were made to the King and Queen:—Sir Vincent Caillard, D.L., J.P., the Hon. Sir Charles Parsons, Sir Alexander Gibb, Sir James Kemnal, Mr. Charles H. Merz (consulting engineer), Mr. F. C. McQuown (manager and secretary), Mr. A. R. Bacon (chief station engineer), Mr. J. D. Dallas (chief mains engineer), Mr. J. Vice (resident engineer), Messrs. Jimmy Lindfield and George Rose (workmen).

Fatality.—On May 18th, Mr. Ted Wright received a fatal electric shock while laying a service cable at Mitcham.

The Export of Power from Canada.—The Toronto correspondent of *The Times* says that the export of hydro-electric power is likely to become a vital issue in Canadian politics. The Governments of Quebec and Ontario are united against export, and will probably take extreme measures against any attempt of the Federal Government to give franchises for export. The Provinces contend that all power should be reserved for industrial development in the Dominion, and that American industries seeking to benefit by the Canadian power supply should establish themselves in Canada. It is further argued that once leases for export have been granted and industries have been established in the United States, depending upon power from Canada, it will be impossible, no matter how positive are the terms of the contract, to cancel the leases without the danger of disturbing international relations. The contract between the Government and the Carillon Industrial Corporation of Ottawa has just been tabled in the House of Commons, and will be the subject of energetic debate. The contract, which is still unsigned, provides that the surplus power produced by the company over 100,000 h.p. will be exported to the United States. The term of the contract is until January 1st, 1943, but there are renewal clauses, which will probably give permanent life to the contract. The rentals to the Government, payable in advance, run from $50,000 (£10,000) a year in 1929 to $150,000 (£30,000) in 1964. The company hopes to be able to develop 400,000 h.p., of which 100,000 h.p. is for Canadian consumers.

A New Miners' Lamp Battery.—We learn that Mr. H. F. Joel is shortly bringing out an improved form of accumulator for use in miners' lamps.

Accidents.—An explosion occurred in a telephone inspection box at Bromley Common on May 20th. Two linesmen, I. Reeves and W. Gatting, were badly burned about their arms and faces.

Three men were injured by an explosion at the Hull Corporation electricity works on May 23rd. The men were carrying out additions to the 6,000-V switchgear when a short circuit occurred. Two of the men received serious burns about the face, head and arms, and were conveyed to the infirmary in a serious condition. The third employé's injuries were not serious and he was not detained at the hospital. The electricity supply in the town was dislocated from 10 to 25 minutes as a result of the accident. The explosion blew out the switchboard.

Electric Drive in Indian Mills. — More than half the Bombay mills to-day are being driven by electrical energy supplied by the Tata hydro-electric companies. The most recent installations are those effected in the Sassoon Mills. Out of 15 mills belonging to Messrs. E. D. Sassoon & Co., in Bombay, eight are now electrically driven, the power being obtained from the Andhra Valley Power Company's two stations which have capacities of 50,000 kW and 40,000 kW respectively, the supply pressure being 100 kV. The power is transmitted in both cases, over lines 50 miles in length, to two main sub-stations, where it is transformed down to 22 and 6.6 kV respectively, to be afterwards distributed to the eight different mill sub-stations. Four of the latter are arranged for an incoming pressure of 22 kV, while the remaining four are supplied at 6.6 kV from the main sub-stations. The power is taken into each mill sub-station by duplicate cables. Where these terminate, the Power Supply Co. has provided its own switchgear, consisting of disconnecting links, circuit-breakers and instruments for metering the power supplied.

Static Electricity. — The danger of static electricity causing an outbreak of fire in a motor-car when the tank is filled with petrol is pointed out in the annual report of the Inspectors of Explosives. If the petrol tank is electrically insulated from the ground by means of the rubber tires of the car, as it invariably is, the friction of the petrol being poured into the tank may produce sufficient static electricity to cause a spark which will ignite the petrol. A fatal fire was recently caused in the United States in this way and a similar fatal explosion was caused last August at the Shell-Mex works at Shell Haven, on the Essex side of the Thames Estuary, and the company has issued instructions that during the filling of a petrol tank the car must be "earthed" by a metal chain provided for the purpose. It has been demonstrated, says the report, that when any grade of paraffin or petrol is pumped through pipe lines static electricity is produced by the friction of the spirit against the walls of the pipe.—*Daily Mail.*

Electricity Supply Rifle League.—The following are the results of matches which took place in April:—*Division* 1.—Central A 590, City A 580; Central B 565, St. James' 565; and Shoreditch A 583, City A 576. *Division* 2.—Central C 564, Hackney 518; Central C 578, St. James' A 550; City B 561, Shoreditch B 532; Shoreditch B 532, Epsom 330; and St. James' A 535, Hackney 529.

Institution Notes.

Institution of Electrical Engineers.—WESTERN CENTRE.—*Summer Meeting.*—On May 22nd the Western Centre of the Institution held its summer meeting at Dursley, Gloucestershire, the event being ably organised by Mr. A. J. Ostler, joint hon. secretary, Bristol. The South Wales party journeyed in fifteen motor-cars to Gloucester, and joined forces with the party from the south side of the Bristol Channel. The party was received by members of the firm of Messrs. R. A. Lister & Co., Ltd., and were entertained to luncheon, after which, under the chairmanship of Mr. W. Nairn, M.I.E.E., the 14th annual general meeting took place. The following officers and committee were, according to the *South Wales News*, elected:—Mr. J. W. Burr, borough electrical engineer, Swansea, chairman; Mr. W. G. Heath, contractor, Plymouth, first vice-chairman; Mr. C. G. Morley New, city electrical engineer, Cardiff, second vice-chairman; Mr. F. H. Corson city electrical engineer, Gloucester; Major E. I. David, M.I.E.E., chief electrical engineer, Powell Duffryn Steam Coal Co., Aberaman; Sir A. Whitten Brown, Swansea; Mr. W. E. Hardy, general manager and engineer, Bath Electric Tramways, Ltd.

In response to an appeal by Mr. T. Hood, Bristol, a collection was made for the I.E.E. Benevolent Fund, which realised the sum of £12. After an escorted tour of inspection of Messrs. Lister's extensive works and tea, the chairman, in proposing a vote of thanks to Messrs. R. A. Lister, said that everybody was agreeably surprised that such a large proportion of their output was shipped to America and the Colonies. Sir Ashton Lister, Kt., responded.

Diesel Engine Users' Association.—PYROMETERS.—At the May meeting of the Association a paper by Mr. Chas. E. Foster on the subject of "Pyrometry of Exhaust Temperatures of Internal-combustion Engines" was read and discussed. Apart from the undoubted value of exhaust temperature measurement in adjusting an engine, it seemed clear to the author that the measurement must be continued in ordinary routine running in order that the charge engineer might have the earliest intimation of impending trouble. He addressed himself more particularly to the design, arrangement, and operation of the pyrometer itself, pointing out that there were two main types: one consisting of a thermo-electric couple and the other of a resistance thermometer which required an external source of current, such as an accumulator. For certain reasons the resistance type had certain disadvantages, which rendered it less suitable for the particular work in question; the sensitive part which had to be raised to the temperature of the exhaust gases was a coil of fine wire mounted on some form of insulated bobbin, and it was obvious that the mass and thermal capacity of such a resistance coil and bobbin was greater than that of a simple thermo-couple junction; since it was essential to enclose the resistance coil in an outer sheath, the time lag and conduction error might easily be greater than that of the worst design of thermo-couple. A third type was the expansion pyrometer, in which a bulb containing mercury under pressure was connected by a fine-bore capillary tube to a Bourdon pressure gauge calibrated in temperature. It was not safe to use an expansion pyrometer of this type over about 400 deg. C., and even if it were it would involve a separate indicating dial for each exhaust pipe. The thermo-couple was considered the correct type of instrument, and the author devoted a considerable portion of his paper to an explanation of its theory and construction.

Institution of Mining Engineers.—CARDIFF MEETING.—A general meeting of the Institution will be held at Cardiff on June 16th, 17th, and 18th. In view of the prevailing conditions in the coal industry, it has been decided to confine the programme to formal gatherings and visits of technical interest. Amongst the papers to be read and discussed there is one on "The Maximum Efficiency of Heat Engines and the Future of Coal and Steam as Motive Agents," by Dr. J. S. Haldane, F.R.S. The annual dinner will take place on June 17th, and on the following day the programme includes visits to the collieries and power station of the Powell Duffryn Steam Coal Co., Ltd., and the Cardiff-Dowlais works of Messrs. Guest, Keen & Nettlefolds, Ltd.

Association of Mining Electrical Engineers.—NORTHERN BRANCH.—The annual meeting of the North of England branch of the Association was held at Whitley Bay on May 23rd, when the officers were elected as follows:—President: Mr. S. Tulip; vice-presidents: Prof. G. Poole, B.Sc., and Mr. T. A. W. Smith; treasurer: Mr. E. E. Shatford; secretary: Mr. J. E. Favell; members of committee: Messrs. W. Bickerton, H. Fenwick, J. E. Lambert, and G. Ward; representatives to General Council: Messrs. S. Tulip, J. E. Favell, E. E. Shatford, S. A. Simon, and A. R. Hill.

Institute of Metals.—SCOTTISH MEETING.—The annual autumn meeting of the Institute will take place in Glasgow from Tuesday, September 1st, to Friday, September 4th. The reception committee is presided over by Lord Weir of Eastwood. On September 1st, the annual autumn lecture will be delivered by Sir John Dewrance, K.B.E., vice-president. In addition to the reading and discussion of papers, visits will be paid to engineering works, there will be a reception by the Lord Provost and magistrates, a sail down the River Clyde and an all-day tour to Loch Lomond, Loch Katrine, and the Trossachs.

Our Personal Column.

The Editors invite electrical men, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Mr. A. H. DARKER, A.M.I.E.E., chief electrical engineer of Messrs. J. Stone & Co., Ltd., who has been making a world tour, has returned to London.

The British Chamber of Commerce *Journal*, Shanghai, reported in its April issue that Mr. T. H. U. ALDRIDGE, of the Shanghai Municipal Electricity Department, had returned from home leave.

The same paper stated that during the absence in England of Mr. P. H. NYE, managing director of the General Electric Co. (of China), Ltd., Messrs. S. C. GILBERT and R. N. NICHOLS would be joint acting general managers of the company.

The *Industrial Australian and Mining Standard* states that Mr. H. CLEMENT NEWTON, engineer and manager in Australia and New Zealand for British Insulated & Helsby Cables, Ltd., left early in April for a short visit to England.

The Highways Committee of the London County Council recommends that Major A. E. CARR, D.S.O., M.C., repairs superintendent, be promoted to the position of assistant power-station engineer in the electrical branch of the tramways department, at a commencing salary of £568, rising by annual increments to £696 in five years' time. The Committee also recommends that Mr. S. C. TRANTER, charge shift engineer, be promoted to the position of combustion engineer, at a salary of £441, rising in three years to £505; and that Mr. M. F. ALLSOP be appointed charge shift engineer, at a salary of £377, rising in five years to £441.

On leaving Rotherham to become tramway manager at Chesterfield, Mr. W. D. MARKS was presented by the staff with a spirit tantalus; by the inspectors with a framed photo-

graph of the staff; by the workmen of the depôt with a pair of silver candlesticks; and by the local branch of the National Association of Local Government Officials, with a coffee service, and a gold wristlet watch for his wife.

Mr. J. WELLING, permanent-way engineer in the L.C.C. Tramways Department, retires on June 30th owing to ill-health. The General Purposes Committee recommends an additional retiring allowance, making his pension £504 per annum.

Mr. P. S. HAYBURN has been appointed manager of the Marconi International Marine Communication Co., Ltd. He has been associated with the company for 21 years, and has been assistant general manager since December, 1922. During the war, when the Belgian company's business was conducted from London, Mr. Hayburn was in control of neutral ships fitted with wireless. He returned to the English company in 1920, and acted as assistant to the late general manager, Mr. W. W. Bradfield, C.B.E., from June, 1921. Mr. JAMES ARCHIBALD CARSWELL, managing director of Messrs. Macnaughton Bros., of Glasgow, who have represented the Marconi International Marine Communication Co. in Scotland since 1911, has been appointed deputy manager for Scotland, the North of England, and Northern Ireland. He will remain at Glasgow, with his office at 41, St. Vincent Place.

Mr. G. D. BENDIX, assistant station superintendent at the West Ham electricity works, has been promoted to the position of station superintendent (Grade No. 2 Class G, E.P.E.A. scale) at £777 per annum.

The Oldham Corporation Tramways Committee has presented a silver cigar and cigarette box to Mr. WILLIAM CHAMBERLAIN, tramway manager and engineer, who has been appointed to a similar position with the Leeds Corporation.

Obituary.—MR. F. SPENCER.—We regret to record that Mr. Frederick Spencer has passed away at Andsell, near Lytham, Lancs., at the age of 73. He was the first general manager of the Halifax Corporation tramways, taking up the appointment in 1898, when the Corporation introduced electric tramways. He was previously manager at Walsall. He invented a number of tramway improvements, especially with regard to tramcar braking. He retired 17 years ago. Mr. Christopher J. Spencer, former tramway manager at Bradford, and now of the Metropolitan and Underground railways, is one of his sons.

MR. J. W. HENSLEY.—The death is reported in *The Times*, of Mr. John William Hensley, director, Indian Government Telegraphs (retired). Mr. Hensley passed away on May 14th, after an operation, at the age of 67 years.

MR. H. H. MILLER.—The death occurred suddenly on May 12th of Mr. Harry H. Miller, who was an electrical engineer at Appleby Castle, in the service of Lord Hothfield. He was 38 years of age.

REV. A. L. CORTIE.—The death occurred recently of the Rev. A. L. Cortie, S.J., who was director of the Stonyhurst College (Blackburn) observatory. Father Cortie was an acknowledged expert on terrestrial magnetism and sun spots, and read numerous papers on these subjects before the British Association.

New Companies Registered.

Bestolamps, Ltd. (206,026).—Private company. Registered May 18th. Capital, £3,000 in 10,000 ordinary shares of 1s. each and 2,500 10 per cent. cumulative and participating preference shares of £1 each. Objects: To carry on the business of manufacturers of, agents for and dealers in all kinds of materials, apparatus, implements, accessories or other goods used in connection with electricity, electrical engineers, electricians and public works contractors, concessionaires for the supply of gas or electric lamps, &c. The subscribers (each with one preference share) are:—D. Macleod, 8, Kingsford Street, Hampstead, electrical engineer; W. C. Jones, 32, Victoria Street, Westminster, company secretary. The subscribers are to appoint the first directors. Qualification, 500 shares. Secretary: W. C. Jones. Registered office: 32, Victoria Street, Westminster, S.W.

N. V. Webber & Co., Ltd. (206,011).—Private company. Registered May 16th. Capital, £500 in £1 shares (350 ordinary and 150 7½ per cent. cumulative participating preference). Objects: To acquire the business of an electric and radio engineer now carried on by N. V. Webber at Weybridge, Surrey, as "N. V. Webber & Co." The directors are:—N. V. Webber, Walton House, Walton-on-Thames, Surrey; D. R. Verey, Greyshaw, Elsmere Road, Weybridge, Surrey. Remuneration (except managing director, if any), £150 each per annum. Solicitors: Pennington & Son, 66, Lincoln's Inn Fields, W.C.2.

Receptors, Ltd. (205,870).—Private company. Registered May 11th. Capital, £1,000 in 1s. shares. Objects: To act as radio and general engineers, manufacturers of broadcast receiving sets and components, &c. The directors are:—W. Wrentmore, 202, Old Road West, Gravesend, engineer (permanent managing director); and F. A. Merton, 2, Tyndale Terrace, Highbury, N.1, surveyor. Qualification, 1 share. Registered office: 245, Shaftesbury Avenue, W.C.2.

Mansbridge Condenser Co., Ltd. (206,050).—Private company. Registered May 18th. Capital, £25,000 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers, manufacturers of electrical condensers, electrical, wireless, and protective apparatus, &c. The subscribers (each with one share) are:—A. C. Bankes, 21, Woodland Road, New Southgate, N.11, managing clerk; P. V. P. Stone, 24, Elmfield Mansions, Balham, S.W.17, clerk. The first directors are to be appointed by the subscribers. Remuneration as fixed by the company. Solicitors: Arthur Veasey and Co., Aldwych House, W.C.1. Registered office: Ducon Works, Victoria Road, North Acton, W.3.

London Radio Co. (Leeds), Ltd. (206,120).—Private company. Registered May 21st. Capital, £1,000 in £1 shares. Objects: To acquire the business of a dealer in wireless and cycle accessories now carried on by H. A. Riche at 20, Queen's Arcade, Leeds, as the "London Radio Co." The provisional directors are:—H. A. Riche, 20, Queen's Arcade, Leeds, wireless engineer; Mrs. I. Riche, 26, Starthmore Street, Harehills Lane, Leeds. Qualification, 20 shares. Remuneration as fixed by the company. Secretary: T. J. Nesbitt, 21, Well Close Mount, Leeds.

Midland Electrical Tube Co., Ltd. (206,051).—Private company. Registered May 18th. Capital, £100 in £1 shares. Objects: To acquire land at Batmans Hill, Bradley, near Bilston, Staffs., together with the buildings, machinery and offices erected thereon, and to carry on the business of tube makers, general engineers, merchants, &c. The directors are:—W. J. Sharman, 27, St. Clement's Avenue, Blackenall, Walsall, tube manufacturer (permanent managing director); G. Redshaw, 68, Preston Road, Birmingham, blacksmith; Mrs. E. M. Redshaw, 68, Preston Road, Birmingham. Registered office: 177, Corporation Street, Birmingham.

Tungstone Accumulator Co., Ltd. (206,100).—Private company. Registered May 20th. Capital, £1,000 in £1 shares. Objects: To acquire the British trade mark "Tungstone," and to carry on the business of engineers, woodworkers, electricians, manufacturers and factors of engineering and electrical appliances of all kinds, &c. The subscribers (each with one share) are:—H. T. Appleton, 5, Shirley Park Road, Croydon, Surrey, commercial manager; F. W. Priest, 82, Pepys Road, New Cross, S.E.14, incorporated accountant. The subscribers are to appoint the first directors. Qualification, 1 share. Remuneration as fixed by the company. Solicitors: Caporn and Campbell, St. Bride's House, Salisbury Square, E.C.4. Registered office: 3, St. Bride's House, Salisbury Square, E.C.4.

Bennetts (Electrical Engineers), Ltd. (206,078).—Private company. Registered May 20th. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with F. G. Brown to develop and turn to account the business of an electrical engineer carried on by him at 19, Villiers Street, W.C.2, and to carry on the business of electricians, electrical contractors, suppliers of electricity, manufacturers of and dealers in wireless apparatus, &c. The permanent directors are:—C. R. Bennett, 6, Chelmsford Road, South Woodford, electrical engineer; F. G. Brown, 2, Mayville Road, Leytonstone, electrical engineer; W. H. Culley, 45, Colehill Lane, Fulham. Qualification, £40. Remuneration as fixed by the company. Secretary: C. R. Bennett. Solicitors: Loxley, Gardner & Sewell, 1 and 2, Bucklersbury, E.C.4. Registered office: 19, Villiers Street, Strand, W.C.

Capel & Co., Ltd. (206,001).—Private company. Registered May 16th. Capital, £7,500 in £1 shares. Objects: To acquire the business of engineers, &c., carried on by Clara Capel and W. C. Howard at 168, Dalston Lane, E., as "Capel & Co.," to adopt agreements (*a*) with the said parties, and (*b*) with the above named company, and to carry on the business of mechanical, electrical, motor and water engineers, manufacturers of and dealers in engines of all kinds, founders, &c. The subscribers (each with one share) are:—J. B. Kerr, "Braeside," Richmond Road, New Barnet, engineer; F. J. Sellers, 42, Church Crescent, Muswell Hill, N.10, engineer. The first directors are:—J. B. Kerr (permanent chairman and managing director) and others to be appointed by the subscribers. Qualification, £250. Remuneration, £250 per annum divided between them. Solicitors: Prestons, 87, The Grove, Stratford, Essex. Registered office: 168, Dalston Lane, E.8.

F. Malby & Co., Ltd. (206,085).—Private company. Registered May 20th. Capital, £1,000 in £1 shares. Objects: To acquire the business of a wireless and electrical engineer carried on by F. Malby at Clacton-on-Sea, Essex. The subscribers (each with one share) are:—J. C. Kistruck, Mountville, Old Road, Clacton-on-Sea, solicitor's clerk; R. S. Carr, 32, Lexden Road, Colchester, solicitor. The first directors are to be appointed by the subscribers. Solicitor: E. M. Leaning, Station Road, Clacton-on-Sea.

Charles Warren, Ltd. (206,081).—Private company. Registered May 20th. Capital, £6,000 in £1 shares. Objects: To acquire the business of an electrical, motor and cycle engineer, agent for and dealer in motors and cycles, engines and vehicles and wireless apparatus, electrical and general dealer now carried on by C. Warren at Witham, Essex. The directors are:—C. Warren, Poplar Hall, Witham; F. R. Green, 53, High Street, Witham; J. L. Green, Bury House, Ruislip, Middlesex. Qualification, 200 shares. Secretary: E. R. Green. Solicitors: F. H. Bright & Sons, Witham. Registered office: West End Garage, Witham.

Siemens-Schuckert (Great Britain), Ltd. (206,143).—Private company. Registered May 22nd. Capital, £10,000 in £1 shares. Objects: To carry on the business of engineers, electrical engineers, electricians, suppliers of electricity, electrical contractors, Government and general contractors; to act as general agents in England and elsewhere for Siemens-Schuckert or any other company or firm, &c. The subscribers are:—L. F. Szilagyi, 16, Helenslea Avenue, N.W.11, consulting engineer, 100 shares; J. A. Milne, 82, Hazelwood Lane, Palmers Green, N.13, chartered secretary, one share. The subscribers are to appoint the first directors. Qualification, 100 shares. Remuneration, £150 each per annum and a percentage of the profits. Solicitors: Nicholson, Graham and Jones, 19-21, Moorgate, E.C.2.

Acme Electric Lamp Co., Ltd. (206,146).—Private company. Registered May 22nd. Capital, £1,000 in £1 shares. Objects: To acquire the business of a manufacturer, importer and exporter of electric lamps now carried on by H. S. Tyler at 2 and 3, Station Road, Balham, as the Acme Electric Co. The subscribers (each with one share) are:—H. S. Tyler, 47, Rudloe Road, Clapham Park, S.W.12, electrical engineer; A. Hammond, 45, Dalberg Road, Brixton, S.W.2, general merchant. H. S. Tyler is permanent director. Qualification, 1 share. Secretary: Beatrice Kersley. Solicitor: Anstey & Co., Panton House, Haymarket, S.W.1.

Radio and Electro Technical Industries, Ltd. (206,094).—Private company. Registered May 20th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical engineers, sellers and agents for export and import of all commodities connected with the business of electrical and radio engineers and all classes of wireless business, and accessories connected therewith, &c. The subscribers (each with one share) are:—A. Lerman, 142, Rothschilds Mansions, Commercial Street, E.1, traveller; I. Falkenflicz, 48, Gore Road, Victoria Park, N.E., merchant. The first directors are: A. Lerman and G. Tschief. Qualification, 2 shares. Secretary: I. Falkenflicz. Solicitor: P. S. Cosserton, 190, Bishopsgate, E.C. Registered office: 87-88, Charterhouse Chambers, Charterhouse Square, E.C.

Official Returns of Electrical Companies.

Secret Wireless, Ltd.—Registered at Edinburgh on Sept. 18th, 1924, as a private company. The nominal capital is £10,000 in 10,000 ordinary shares of £1 each, of which to April 27th, 1925, 7,601 had been issued, £2,301 being paid up in cash and £5,300 being credited as paid. At the date named there were no debentures or similar charges outstanding.

Davis, Ash & Co., Ltd.—E. T. Wood, C.A., of 26-27, King Street, Guildhall, E.C.2, was appointed receiver on May 11th, under powers contained in debenture dated January 30th, 1925.

Never-Stop Transit, Ltd.—F. W. Parritt, C.A., of 94, Old Broad Street, E.C.2, was appointed receiver and manager on May 7th, 1925, under powers contained in trust deed dated December 17th, 1923.

Adams Brothers (Longton, 1925), Ltd.—Debenture bond dated May 5th, 1925, to secure £1,000 charged on the company's property, present and future, including uncalled capital. Holder: F. A. Spruce, Grindley Lane, Blythe Bridge, Staffs.

Skegness Electricity Supply Co., Ltd. — Issue on April 30th, 1925, of £100 debentures, part of a series already registered.

Herbert Smith & Jones, Ltd. (formerly Automobile and Electrical Equipments, Ltd.).—Debenture dated May 4th, 1925, to secure £200, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. Herbert-Smith, 24, Sedgeford Road, Old Oak Road, W.12.

Midland Valves, Ltd.—Particulars filed of £1,200 debentures authorised April 28th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Tredegars (1923), Ltd.—Particulars filed of £12,000 debentures authorised April 24th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital (if any), the amount of the present issue being £7,000.

Oxford Scientific Instrument Co., Ltd.—Particulars filed of £1,000 debentures authorised April 28th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £200.

Woodhall Wireless Manufacturing Co., Ltd.—Particulars filed of £4,000 debentures authorised April 28th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £2,800.

"Ego" Engineering Co., Ltd.—Debenture dated May 7th, 1925, to secure £800, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Annie A. Joyce, 220, Shaftesbury Avenue, W.C.

British Battery Co., Ltd.—Satisfaction in full as from April 16th, 1925, of debenture dated May 17th, 1915, securing £700.

Marrec, Ltd.—Satisfaction in full on April 11th, 1925, of mortgage or charge dated February 4th, 1924, securing all moneys due to Barclay's Bank, Ltd.

W. S. Laycock, Ltd.—Deed poll dated May 5th, 1925, to secure the proper remuneration of the receiver and manager, B. Coathupe, and payment and satisfaction by way of complete indemnity of all debts, liabilities and obligations (if any), properly incurred or undertaken by him as receiver and manager so that he may be kept completely indemnified in respect of all matters properly done by him during his course of receivership and managership, constituting a floating charge ranking in priority to all existing charges over all the property and assets, present and future, this charge to continue in existence for one year from the date of discharge by the Court. Holder: B. Coathupe, 87, Victoria Street, S.W.1.

Flactem Wireless, Ltd.—H. Bottomley, of Pearl Chambers, East Parade, Leeds, ceased to act as receiver or manager on May 12th, 1925.

Woodstock Electric Light Co., Ltd. (181,541).—Return dated June 30th, 1924 (filed February 12th, 1925). Capital, £5,000 in £1 shares. 4,237 shares taken up. £4,184 paid. £53 considered as paid. Mortgages and charges, nil.

Grosvenor Clark Electrical, Ltd. (181,548).—Return dated February 16th, 1925. Capital, £1,000 in £1 shares. 150 shares taken up. £150 paid. Mortgages and charges, nil.

Sunray, Ltd. (182,199).—Return dated April 18th, 1925. Capital, £2,000 in £1 shares. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Summit Electrical Co., Ltd. (182,383).—Return dated February 16th, 1925. Capital, £100 in £1 shares. All shares taken up. £100 paid. Mortgages and charges, nil.

Dubilier Condenser Co., Ltd. (178,173).—Return dated April 6th, 1925. Capital, £200,000 in £1 shares. 75,000 shares taken up. £35,000 paid. £40,000 considered as paid. Mortgages and charges, nil. Return of allotments dated *March 23rd, 1925 (filed April 28th) shows a further 125,000 shares allotted as fully paid (capitalisation of reserve).

*The resolution to allot these shares was passed on March 23rd, but probably the actual allotment took place later.

Vio-Ray Electric Co., Ltd. (178,937).—Return dated December 31st, 1924. Capital, £1,000 in £1 shares. 377 shares taken up. £377 paid. Mortgages and charges, nil.

Sterling Accessories, Ltd. (178,768).—Return dated December 31st, 1924. Capital, £1,000 in £1 shares. 802 shares taken up. £2 paid. £800 considered as paid. Mortgages and charges, nil.

Blocley Electrical Engineering Co., Ltd. (178,315).—Return dated December 31st, 1924. Capital, £1,000 in £1 shares. 902 shares taken up. £902 paid. Mortgages and charges, nil.

Tounlea Electrical Co., Ltd. (189,297). — Return dated December 26th, 1924. Capital, £1,000 in 300 preference and 700 ordinary shares of £1 each. 500 ordinary shares taken up. £500 considered as paid. Mortgages and charges, nil.

Nox Electric Lamp Co., Ltd. (189,377). — Return dated December 31st, 1924. Capital, £2,000 in £1 shares. 502 shares taken up. £2 paid. £500 considered as paid. Mortgages and charges, £662 13s. 4d.

Northwood Electric Light and Power Co., Ltd.—Satisfaction in full on April 1st, 1925, of debentures issued between May 6th, 1910, and September 9th, 1914, securing £4,625.

English Electric Co., Ltd.—Demise dated May 8th, 1925 (supplemental to trust deed dated September 15th, 1919, securing £1,000,000 5½ per cent. sinking fund first mortgage debentures), charged on lands at Preston, certain rights to construct railway sidings, &c. Trustees: Debenture Corporation, Ltd., Worcester House, Walbrook, E.C. Also conveyance and demise dated May 9th, 1925 (supplemental to trust deed dated August 14th, 1923, securing £1,000,000 6 per cent. convertible debenture stock), charged on various properties in Bradford, Preston, Ashton-upon-Ribble, Coventry, New Bilton, Rugby, Hough, Castle Church, Lytham and Stafford, lands, certain rights, covenants, &c. Trustees: Anglo-American Debenture Corporation, Ltd., 320, Gresham House, E.C.

Welwyn Garden City Electricity Supply Co., Ltd. (181,468).—Return dated June 14th, 1924 (filed January 8th, 1925). Capital, £25,000 in 23,500 preference shares of £1 each and 30,000 ordinary shares of 1s. each. 503 preference shares taken up. £1 per share called up. £233 paid, leaving £270 in arrears. Mortgages and charges at date of return, nil. Since registered, debenture dated September 29th, 1924, to secure £20,000.

Sturge & Baker, Ltd. (181,382).—Return dated February 25th, 1925. Capital, £8,000 in £1 shares (1,500 preference and 6,500 ordinary). 1,500 preference and 5,896 ordinary shares taken up. £7,396 considered as paid. Mortgages and charges, nil.

Invincible Electrical Engineering Co., Ltd. (181,286).—Return dated January 14th, 1925. Capital, £1,000 in £1 shares. 400 shares taken up. £400 paid. Mortgages and charges, nil.

Graham & Sons, Ltd. (172,842). — Return dated March 10th, 1925. Capital, 5,000 in £1 shares. 300 shares taken up. £300 paid.

Wax Electric Light Tube Manufacturing Co., Ltd. (182,603).—Return dated November 28th, 1924. Capital, £2,268 in 2,250 preference and 18 management shares of £1 each. All shares taken up. £650 paid. £1,618 considered as paid. Mortgages and charges, nil.

Haywards Heath and District Electric Supply Co., Ltd. (181,143).—Return dated December 31st, 1924 (filed March 10th, 1925). Capital, £30,000 in £1 shares. 20,000 shares taken up. £20,000 paid. Mortgages and charges: £5,000 bank charge, and £3,000 debenture.

Spensers (London), Ltd. (180,818).—Return dated December 31st, 1924 (filed March 16th, 1925). Capital, £12,000 in £1 shares. 10,153 shares taken up. £2,153 paid. £8,000 considered as paid. Mortgages and charges, nil.

Power & Traction Finance Co., Ltd. (181,220).—Return dated January 5th, 1925. Capital, £250,000 in £1 shares. 6,002 shares taken up. £6,002 paid. Mortgages and charges, nil.

Peacehaven Electric Light & Power Co., Ltd. (181,255).—Return dated December 31st, 1924. Capital, £30,000 in 15,000 preference shares of £1 each and 20,000 ordinary shares of 5s. each. 14,038 preference and 16,052 ordinary shares taken up. £1 per share called up on the preference and 5s. per share on the ordinary. £17,845 18s. 1d. paid, leaving £295 1s. 11d. in arrears. Mortgages and charges, nil.

City Notes.

Madras Electric Supply Corporation, Ltd.

The report for 1924 records a net profit of £32,979, and to this is added £6,240 brought forward, making £39,219. It is proposed to transfer £2,000 to the suspense account, to pay a final dividend of 5½ per cent., free of tax, on the ordinary shares, making 8 per cent. tax-free, for the year, and to carry forward £6,186. The tramways showed an available balance of £24,124, after allowing £10,000 for depreciation and adding the balance brought forward. The dividend on the ordinary shares is 8 per cent., free of tax, and £7,124 is carried forward. The sales of energy declined from 10,746,330 to 10,661,740 kWh. Meeting: June 3rd.

Great Northern Telegraph Co., Ltd., of Denmark.

The report of the directors for 1924 states that the financial result of the year was very similar to that of 1923. An increase of about £137,000 in the total receipts was counterbalanced by a corresponding rise in the expenditure. Out of the profits a total dividend and bonus of 22 per cent. is being distributed, of which 5 per cent. was paid during the year. The reserve and renewal fund receives £33,333, and the pension fund £55,556, and £313,670 is carried forward. The company's cables, due to the efficient maintenance policy, remained in good condition and there was no increase in the number of interruptions. The Vladivostok and Kiachta routes worked exceedingly well during the year, but the Helampo route was not workable between Harbin and Peking for a considerable time owing to the Chinese civil war. This, however, in no way interfered with the company's carrying over the northern section of the line between Irkutsk and Harbin, the Manchurian terminal traffic exchanged with Europe, America, &c. With the assistance of the Russian Telegraph Department the company steadily improved the services over the trunk lines between its offices at Leningrad, Irkutsk and Vladivostok. A new detailed concession has recently been ratified by the Danish Parliament in respect of all the company's cables landed in Denmark until the end of 1944. The concession is considerably less favourable than the old one and will have its effect upon the 1925 revenue. The provisional extension of the company's French concession expired at March 31st last. Negotiations with the French administration have resulted in a draft concession regarding which agreement has almost been reached. From a financial point of view, this concession is also more unfavourable to the company than the previous one. The company's concession in respect of the Iceland cable, which expires in 1926, has been the subject of provisional negotiations with a view to its prolongation. It is possible that the ultimate conditions will prove unacceptable because the potential benefits offered would be out of proportion to the risk incurred. The negotiations with China regarding the extension of the existing agreements between the Chinese Government on the one part and the company and the Eastern Extension, Australasia, and China Telegraph Co., on the other part, were continued with the new Government, and they are progressing on a basis which gives some promise of a settlement. The Sino-Japanese Government cable between Dsingtau and Sasebo was opened for traffic on February 1st, 1925, without the previous consent of the company or the Eastern Extension Co. As in 1923, radio routes deprived the company of a certain amount of traffic, especially traffic exchanged with Sweden. The reason for this is that Governments favour their own radio stations although the general public, as a rule, prefer transmission by cable if the rates are the same. Nevertheless, the decrease in the number of words transmitted was not very important. It is expected that radio competition will make itself more felt in time to come when radio stations are opened in opposition to the cables. During the past year negotiations were opened with the British G.P.O. with regard to the lease, or purchase, by the company of the Stonehaven radio station. These negotiations have been postponed for various reasons. The report makes reference to a new type of cable which, by means of greatly increased self-induction, permits of a greater signalling speed. The new type, however,

does not at present appear to offer sufficient technical or economical advantages for use on such comparatively short lengths of cables as those constituting the submarine sections of the company's system. Reference is also made to the International Cable Companies' Association, the director of which is Mr. F. J. Brown, formerly assistant secretary of the General Post Office. The annual meeting is to be held in Copenhagen on May 29th

Callender's Cable and Construction Co., Ltd.

The directors' report for the year ended December, 1924 (to which brief reference was made here last week), shows a balance of £321,708 to the credit of profit and loss. Debenture interest absorbs £13,500; 6½ per cent. preference dividend, £26,000; 7½ per cent. preference dividend, £30 000; and there is appropriated for depreciation £30,500; leaving £221,708, plus £315,987 brought forward from 1923, making £537,695 available. The total distribution on the ordinary shares is 3s. per share (less tax), or 15 per cent. for the year, leaving £462,695 to be carried forward. A record business was done, and the profit resulting therefrom, in spite of much competition, is considered satisfactory. All the factories of the company were fully employed, and they so continue at the present time. The outstanding feature of the year's business was the heavy demand for e.h.p. mains. "It appears probable that this will continue for some time to come. The course adopted by your directors in enlarging your company's facilities for manufacturing such cables has thus been fully justified. Considerable expenditure was incurred during 1924 for new buildings and plant to enable the company to increase its production in such mains. These extensions were only completed during the early part of the present year, but they have already proved of great service and will enable your company to handle effectively the important contracts which are likely to be placed in the near future." The demand for electric mains for all purposes and at all voltages continues, and the general business of the company shows no signs of diminishing. The management has seized every opportunity to extend the sphere of the company's operations, and one of the most interesting developments is its co-operation in the Sudan with other leading firms to deal with public services in Khartoum and its neighbourhood. The business of the company elsewhere overseas is being generally extended. The report continues:—"During last autumn your company received visits from many of the managers of leading electric supply undertakings in the United States, and thus obtained much valuable information as to the large requirements in America for the type of cable in which the company specialises. Negotiations with the Okonite Co., of Passaic, N.J., for the development of your manufactures in the States, resulted in the formation of the Okonite Callender Cable Co. by the two interests. Your directors consider that they have been fortunate in entering into close relations with the Okonite Co., which is one of the oldest electrical manufacturing corporations in America. The Okonite-Callender Cable Co. has acquired premises in Paterson, N.J., where plant of the most modern description is now being installed and is expected to be ready for commercial production in August. Your directors have every hope that the joint working with the Okonite Co. will lead to results which will prove eminently satisfactory. In view of the rapidly-expanding business of your company and its continued development and extension, it has been found that its existing capital resources are now inadequate, even allowing for the large credit shown in your accounts, all of which is employed in the company's business and has helped materially to produce the satisfactory results now submitted to you."

The directors therefore consider that the capital should be increased by an issue of ordinary shares, and at an extraordinary general meeting which was to follow the general meeting on Thursday, May 28th, resolutions were to be submitted increasing the capital to £1,500,000 by the creation of 200,000 ordinary shares of £1 each, part of which will be at once offered to the shareholders. As previously indicated, the directors proposed to take powers to form a subsidiary board of advisory directors from among the members of the staff of the company, and the necessary resolutions to this end were also to come before yesterday's meeting.

W. T. Henley's Telegraph Works Co., Ltd.

The directors' report for the fifteen months ended March, 1925, shows a net profit for that period of £361,445. After deducting fees, debenture interest and depreciation, totalling £61,307, and adding £370,175 brought forward from 1923 (less directors' bonus for 1923, £1,250), the amount available is £678 062. Income tax absorbs £28,101; £30,000 is put to reserve; £562 to reserve against trustee securities; and the preference dividend for the year amounts to £9,000. The final dividend of 2s. per share, less tax, now recommended on the ordinary shares, makes 3s. per share for the year 1924, and a further dividend of 1s. per share is to be paid, less income tax, for the first three months of 1925. This leaves £480,396 to be carried forward. During the period covered by the report the business continued to make satisfactory progress. The business of Henley's Tyre and Rubber Co., Ltd., the whole of the shares in which are held by this company, has improved, but is not yet satisfactory; the reserve already made is sufficient provision against loss, and it is not necessary to reserve anything for the current year. Reference is made to the removal to the new premises in Holborn Viaduct. Sir Montague Hughman has joined the board. Meeting: May 29th.

Siemens Bros. and Co., Ltd.

The directors' report for the year ended December, 1924, to which we made brief reference last week, states that the business showed marked improvement throughout the year. Orders flowed in freely, and output was steadily increased, the resulting turnover for the year being largely in excess of that of the previous year, with a corresponding substantial increase in profits; besides which the value of the orders in hand at the end of the year was approximately double that at the beginning of the year. "The foreign business, although still disappointing, is being strenuously cultivated, and signs of improvement are not lacking." Notwithstanding the important extensions recently completed, the influx of orders and the growing use of electricity, with the consequent prospects of a larger volume of business in electrical plant for a considerable time to come, justify still further extensions, and after careful consideration a comprehensive scheme of extensions to buildings and plant at Woolwich has been adopted and work put in hand. This will involve a large expenditure on capital account spread over the next twelve months; partly to provide for this, 250,000 of the company's 10 per cent. cumulative preference shares have been sold, an arrangement which has already had far-reaching benefits for the company's undertaking. The outstanding liability to excess profits duty still remains unadjusted. The matter is in the hands of the company's solicitors and auditors, who are conducting the negotiations with the Inland Revenue authorities, and any amount which the company is likely to be called upon to pay should be well covered by the balance standing to the credit of profit and loss account. The profit for the year, per profit and loss account, was £266,298, an increase over 1923 of £104,068. Interest on and redemption of 4½ per cent. debenture stock absorbs £67,439; one year's dividend on 300,000 10 per cent. cumulative preference shares and three months' on 115,000 requires £32,875. The interim dividend of 2½ per cent. on the ordinary shares required £37,500, and income tax and corporation profits tax, £11,218, and it is proposed to pay a final dividend of 5 per cent. (£75,000), making the total dividend for the year 7½ per cent., and leaving a balance of profit for the year amounting to £42 266, plus £152,762 brought forward, making £195,028. In view of the unsettled excess profits duty, it is proposed to carry this sum forward. The report refers to Mr. George Chauvin's resignation of the position of managing director of the company, and to his retaining his seat on the board; also to the appointment of Mr. Francis Hird, B.A., M.I.E.E., the general manager of the company, to be the managing director.

The meeting was held on Tuesday, May 26th; a report will appear in our next issue.

Birmingham District Power and Traction Co., Ltd.

The report of this company was reviewed in our issue of May 15th (p. 788). The general meeting was held on May 19th, when Mr. C. Shirreff Hamilton, who presided, said that the financial position of the company had further improved during the year: £14,632 of the 4½ per cent. first debenture stock had been redeemed and the discount (£2,261) had been added to the reserve. Over one-third of the issue had now been cancelled. The Special Income Tax Commissioners had decided against the company in the matter of the claims made for excess profits duty and corporation profits tax, but the company was taking the case to the High Court. If, however, the decision was still against the company, there were ample funds to meet the claims without affecting the revenue of future years. The chairman made reference to the pooling agreements entered into with the subsidiary companies, stating that these were rendered necessary by the uncontrolled competition of motor-buses operating over the systems of their subsidiary tramway companies. Though the results of the latter companies had been unsatisfactory, the business of the Birmingham and Midland Omnibus Co. continued to be prosperous. It now operated 337 motor-omnibuses and was the largest provincial undertaking of its kind in the country. The business of the Shropshire, Worcestershire and Staffordshire Electric Power Co. continued to expand, and the company was paying a dividend of 5 per cent. on its ordinary shares, as against 4 per cent. for 1923.

Anglo-Portuguese Telephone Co., Ltd.

Viscount St. Davids (chairman) presided at the annual meeting of the company on May 18th, and in moving the adoption of the report and accounts (ELEC. REV., May 15th, p. 789), he said that the recent record of the results of the company was striking. In 1922 it incurred a loss of £16,000; in 1923 the deficit was £7,200; during last year the company had earned a profit of £5,800. The large capital expenditure which had been made during the past two years (£100,900) was evidence of their belief in the future of the business and the future of Portugal. New exchanges had been installed at Lisbon and Oporto, and these should be opened within two months. The Portuguese Government had met them very fairly and fully in the negotiations for permission to raise their tariffs. A Decree was signed in March which provided for the increased tariffs and periodical revision in order to meet the vagaries of exchange. The effect of this would not be felt in the current year's accounts, as all subscriptions were paid yearly in advance. With regard to the prospects, the chairman said that Portugal was a very variable country and the present conditions were none too good. Nevertheless, they hoped this year to earn a small dividend, and this ought to result unless further ill-luck was encountered.

Barcelona Traction, Light and Power Co., Ltd.

The annual meeting was held on May 18th. Mr. E. R. Peacock, who presided, in moving the adoption of the report (*vide* ELEC. REV., May 15th, p. 788), said that as a result of the reorganisation which had been carried through, the nominal funded debt of the company had been reduced by £4,500,000 and the annual charges by £330,000. Moreover, a greater proportion of the charges was now payable in pesetas, thus reducing the loss on exchange. Great advantages had accrued from the acquisition of the control of the Energia Electrica de Cataluña, and he hoped that further economy and efficiency would result from a more complete fusion of interests. The demand for energy could be met for some years by the extension of their existing hydro-electric plants, and only an abnormal demand (such as railway electrification) would necessitate the building of new stations. By this means energy could be produced at a small cost compared with the cost of energy for new stations. In conclusion, Mr. Peacock said that it had been the policy of the company to place as many orders for machinery in England as possible; English plant had been found entirely satisfactory.

Calcutta Electric Supply Corporation, Ltd.

Lord Meston presided at the annual meeting on May 20th, and in presenting the report and accounts, which were abstracted in our issue of May 15th (p. 788), said that the company was in a strong position to meet the further expenditure which had to be incurred. The amount of energy sold in 1924 was about double the quantity sold in 1921. The gross receipts were almost £700,000, the amount including a "windfall" of £23,000 from favourable exchange. The expenses, owing to general economies and the falling price of coal, were under £320,000. The chief claim upon the gross profit was for depreciation and renewals, £107,002; this figure was bound to grow with the increase of costly plant. The reserve had been strengthened but it was not yet in due proportion to the magnitude of the business. The dividend had been increased without reducing the carry forward. They had reduced their prices to consumers, and they were considering further reductions in the charges for a.c. supplies to large consumers. The greater risk of breakdown necessitated the maintenance of a larger stand-by plant than in England. Special steps had already been taken to ensure the continuity of the supply to the South of Calcutta, including the docks, but they had now decided to erect a new self-contained power house at the docks to work in parallel with the Cossipore station. A site had been obtained and ample provision for future extensions was being made. The first installation was to consist of two 6,000-kW turbo-generators and three 50,000-lb. boilers, with the necessary switchgear. This equipment had been ordered and the cost would be met mainly out of existing resources. The political movements of modern India had had but a slight reaction upon the company's business. British capital had been invested in it, relying upon the good faith of their Indian customers, and Indian enterprise relied upon the good faith of the Corporation to give good and cheap service. Out of this combination nothing but good could result to both sides.

Sir W. G. Armstrong, Whitworth and Co., Ltd.

In the course of his speech at the annual meeting of the company on May 21st, Sir Glynn H. West (chairman), said that the work on the Newfoundland contract was rapidly approaching completion. A large portion of the hydro-electric plant was in actual operation, and it was confidently anticipated that the mills would be producing paper in bulk within the next three months. They were confident that the money invested in the undertaking would yield a good return. Reviewing present conditions, the chairman said that the margin of profit on their contracts was so slight that an increase of as little as 1s. per week in the men's wages would result in a loss to the company.

Swedish Companies.

The *Svenska Ackumulator A.B. Jungner* reports an increase of 24 per cent. in turnover in 1924, chiefly in regard to the export trade. During the year selling companies were organised in Vienna and Madrid. The net profits were 137,000 kr. and the dividend is at the rate of 3 per cent.

The report of the *Allmänna Telefon Aktiebolaget L. M. Ericsson* states that the net profits in 1924 amounted to 2,037,000 kr., as compared with 2,055,000 kr. in the previous year, the dividend being at the rate of 5 per cent., as in 1923. The deliveries from the Stockholm telephone works during the year represented an invoice value of 10,650,000 kr., as against 10,860,000 kr. in 1923, of which the exports formed 8,920,000 kr., and 8,690,000 kr. in the two years respectively. Owing to keen competition, the prices of the company's manufactures in general were lower than in the preceding year, the deliveries having been about 10 per cent. greater than in 1923. Many new automatic telephone installations were carried out last year. After referring to the activity of the English company, the report states that the Austrian company also had a good supply of orders, and the year's result should be favourable, while the Hungarian company also had an improved supply of orders, but its activity suffered towards the end of the year owing to labour disputes, although the distribution was at the rate of 3,000 Austrian crowns per share. In the case of the undertaking in Holland, it had only been possible to carry on working to a limited extent, and no profits were therefore made; nor could the French company show any profits, but there was a large increase in the orders received. The report also refers to the company's interests in Poland, Mexico, Finland, Argentina, and Spain, and mentions the acquisition of an Italian telephone concession by a combination comprising English and Italian interests besides the Swedish company.

French Companies.

The accounts of the *Société de l'Energie Electrique Sud-Ouest*, of Paris, for 1924, show a net profit of 5,502,723 fr., as compared with 4,555,060 fr. in the preceding year.

The net profits of the *Société de l'Energie Electrique du Littoral Mediterranean*, of Paris, during 1924, advanced from 12,080,751 fr. to 13,023,270 fr.

The *Société Gramme* announces net profits of 568,000 fr. for 1924, the rate of distribution being 60 fr. per share as in 1923.

The *Société Anonyme des Magnetos R.9.*, reports net profits of 1,971,000 fr. for 1924, as against 987,000 fr. in the previous year.

The *Compagnie Electro-Mécanique* reports net profits of 3,439,000 fr. for 1924, of which the sum of 3,133,000 fr. has been devoted to depreciation and the balance carried forward.

The *Société d'Electro-Chimie et Electro-Métallurgie*, whose net profits for 1924 are returned at 7,851,000 fr. as compared with 4,764,000 fr. in 1923, proposes to pay a dividend at the rate of 40 fr. per share as against 35 fr. in the previous year.

The *Société Générale des Câbles de Lyon* states that the net profits increased from 772,000 fr. in 1923 to 1,426,000 fr. last year, but the dividend remains at the level of 45 fr. per share.

The directors of the *Radio-Maritime* report a net available surplus of 2,091,000 fr. for 1924, as against 1,439,000 fr. in 1923. The rate of dividend is to be increased from 18 fr. per share to 22 fr.

The *Compagnie du Chemin de Fer Metropolitain*, of Paris, reports a credit balance of 12,590,000 fr. for 1924, as compared with 11,681,000 fr. in the previous year. It is proposed to pay a dividend of 32 fr. per share, as against 31 fr. in 1923.

The *Société des Transports en Commun de la Region Parisienne*, which is the amalgamated tramway undertaking under lease from the Paris City Council, reports a credit balance of 6,969,000 fr. for 1924, as compared with 6,504,000 fr. in 1923. It is intended to increase the rate of distribution from 44.25 fr. to 45 fr. per share.

The *Compagnie Lorraine d'Electricité* states that business developed in 1924, and the concessions were extended by the State until 1974. The net profits were 7,106,000 fr., and the rate of dividend is 12 fr. per share.

The *Compagnie Générale de Télégraphie Sans Fil* earned net profits of 9,405,000 fr. in 1924, as against 7,494,000 fr. in the previous year, and intends to pay a dividend at the rate of 45 fr. per share, as compared with 26.04 fr. in 1923.

German Companies.

The *Korting Electricity Works Company*, of Berlin, recommends a dividend at the rate of 8 per cent. out of the net profits of 200,000 marks in 1924.

The *Concordia Electricity Company*, of Dusseldorf, after having written off 4,320,000 marks for depreciation, records net profits of 228,000 marks for 1924.

The directors of the *Felten and Guillcaume Company*, in recommending a dividend at the rate of 6 per cent., state that the present course of business is satisfactory.

The *Bergmann Electricity Works Company*, of Berlin, reports net profits of 2,270,000 marks, the dividend being at the rate of 5 per cent. on the share capital of 35,000,000 marks.

Swiss Companies.—The report of the *Swiss Electrical Industry Company*, of Glarus, states that the net profits earned in 1924 amounted to 2,290,000 fr., as compared with 1,790,000 fr. in the previous year. It is proposed to pay a dividend at the rate of 8 per cent. on the A and B shares. The electricity works in Lodz was still under the State administration of Poland, although it was hoped that the negotiations with Poland on the matter would soon lead to a satisfactory result. The Russian interests were still being continued for the account of the Soviet Government.

The *Lucerne-Engelburg Electricitatswerke Gesellschaft*, of Lucerne, reports a net profit of 245,162 fr. for last year, enabling a dividend of 5 per cent. to be paid on both the preference and ordinary shares.

Czecho-Slovakian Company.—The *Bratislava Cable Co.*, of Prague, reports a profit of £18,150 for the last financial year, as compared with £32,280 in 1923.

Manila Electric Corporation.—The Associated Gas and Electric Co. has offered to exchange its 6½ per cent. interest bearing convertible debenture obligations for such shares of the capital stock of the Corporation as may be deposited at the rate of $50 principal for each share. It is stated in a letter to stockholders that the return on their holdings will be considerably increased by the exchange.

Stock Exchange Notices.—The undermentioned securities have been ordered to be officially quoted:—

Automatic Telephone Manufacturing Co.—140,000 ordinary shares of £1 each, fully paid, Nos. 360,001 to 500,000.

London Electric Railway Co.—£385,080 consolidated ordinary stock.

Havana Electric Railway, Light & Power Co.—The gross earnings during 1924 amounted to $14,357,901, and the total net income to $7,264,002. The allocations from this include the transfer of $3,240,638 to depreciation and contingencies reserve, and dividends of 6 per cent. on the preferred and common stock (as in 1923). The balance carried forward is $4,475,499.

Glenfield & Kennedy, Ltd.—The report for 1924 shows a profit of £84,638 and the addition of £18,899 brought forward renders available £103,537. It is proposed to pay a final dividend of 7½ per cent. on the ordinary shares (making 10 per cent.), to place £10,000 to reserve, and £2,500 to the staff pension fund, and to carry forward £55,787. The report states that the works were well employed during the year. The prospects for the current year are not so promising but an improvement is hoped for.

Barcelona Traction, Light and Power Co., Ltd.—A dividend of 1 per cent., payable June 30th, has been declared on the 7 per cent. non-cumulative participating preference shares.

Colombo Electric Tramways & Lighting Co., Ltd.—The accounts for the past year show a net profit in Ceylon of £78,132. After adding the balance brought forward (£18,267) and defraying debenture interest and other charges, there remains an available balance of £77,166. Of this £24,500 has been transferred to general reserve, and £4,500 to general renewal account, and a dividend of 15 per cent. (as in 1923) is recommended, leaving £33,040 to be carried forward.

New York Telephone Co.—The *Financial Times* states that the operating revenue for 1924 was $141,338,231 and the net telephone earnings $17,691,916. The addition of revenue from other sources made a total of $24,605,134, as against $26,381,352. Interest charges absorbed $9,674,422 and surcharge New York City, subject to possible refund, $3,875,361. Preferred stock dividends absorbed $1,593,521, and common stock $16,375 360, leaving an unappropriated surplus of $28,333,703.

Oriental Telephone & Electric Co., Ltd.—It is reported by the Hong Kong correspondent of *The Times* that the Legislative Council of Hong Kong has approved the transfer of the company's undertaking in Hong Kong to a new local company with a capital of £1,000,000. The purchase price is stated to be in the neighbourhood of £195 000, the bulk of which will be paid in shares of the new company.

Submarine Cables Trust.—The revenue for the year ended April 15th last was £30,130; the expenses amounted to £1,814, and £28 was brought forward, leaving £28,343. The payment of coupons absorbed £4,452, £23,380 is transferred to the redemption fund, and the balance (£12) is carried forward. During the year 199 certificates were redeemed.

Coventry Chain Co., Ltd.—The directors propose to pay, on July 1st, an interim dividend of 3 per cent. actual, less tax, on the ordinary and preference shares in respect of the six months ended February 28th last. They state that although the business of the company continues to be satisfactory, they consider it prudent to reduce the interim ordinary dividend (from 5 per cent.).

Melbourne Electric Supply Co., Ltd.—At an informal meeting of holders of the consolidated ordinary stock of the company, the terms of the agreement for the sale of the undertaking to the Government of Victoria were approved, and the board was congratulated on the successful result of the negotiations.

Anderston Foundry Co.—The balance available from 1924 is £14,126. It is proposed to pay a final dividend of 6s. per share, making 9s. for the year (as against 12s. in 1923). £3,364 is carried forward subject to directors' fees.

Launceston and District Electric Supply Co., Ltd.—It is proposed to pay a dividend of 6 per cent., free of tax, on the ordinary shares in respect of 1924, out of net profits, including the balance brought forward, of £2,597.

Electric Construction Co., Ltd.—The following final dividends have been declared in respect of the past year: At the rate of 7 per cent. on the preference shares; and at the rate of 9 per cent. on the ordinary shares (making 7½ per cent.), plus a bonus of 2½ per cent.

American Telephone & Telegraph Co.—The usual quarterly dividend of $2.25 has been declared.

Stocks and Shares.

MONDAY EVENING.

EASY running of Stock Exchange markets is again impeded in some degree by the uncertainties that surround the question of money rates. As each Thursday goes by, however, without any change occurring in the Bank Rate, so does confidence in the outlook become a little stronger. It may be said, indeed, that the change-over in so vitally important a matter as that occasioned by the re-establishment of the gold standard has been accomplished with a facility greater than might have been expected, having regard to the conditions of the times. Prices of gilt-edged securities are not much affected. Although the tendency of prices is naturally heavy, owing to money having become a little harder as a natural corollary to the alteration that has taken place, the financial community is not disadvantaged to any appreciable extent.

So far as the industrial markets are concerned, these have escaped from anything worse than a little sympathy with gilt-edged stocks, and, considering the way in which big borrowers are swamping the market with their new issues, there is matter for surprise in finding that prices hold their ground so firmly as they do.

The Royal opening of the new Barking station of the County of London Electric Supply Co. last week had the effect of directing attention to electricity supply shares, and of bringing about a little more public interest in the market than it generally receives at this period of the year. Quotations, however, show no variation worth mentioning on the week. Westminsters are a shade harder at 45s. 6d.; City of London rose 9d. to 47s., Charing Cross to 46s. 3d. On the other hand, Electric Supply Corporation parted with a few pence of the gain which they acquired a week ago. The market as a whole, however, is quiet. Many people are asking what is likely to be the next development in connection with prices, but the inquiries go no further. Holders are content to keep their investments; prospective purchasers are adopting a waiting attitude.

Further activity is being developed by the Southern Counties Electric Light & Power Supply, Ltd., circulars from Bournemouth offering 7 per cent. first mortgage debentures and 8½ per cent. participating preference shares. The directors of the company are Sir Charles B. H. Soame, Bart., Mr. E. Bennett Calvert, Major James Brigden, Mr. Walter H. Mann and Mr. Alexander Martin. This company is one of the group of somewhat similar undertakings to which we have made reference on previous occasions and which we consider the investor will be well advised to shun in face of the absence of such information as should be supplied to everyone who is invited to put money into the electricity supply industry.

The "dollar" stocks are all better on the week. Shawinigan Water rose 7 to 152¼. Montreal Light & Power is 2½ up at 190. Canadian General preferred hardened to 54¼. These advances are due to the London quotations being adjusted to correspond with those ruling on the other side of the Atlantic, in view of the improvement in the rate of exchange.

Callender's ordinary shares fell ¼ to 3 5/16, owing to the strong hint contained in the report that there may be a new issue before long. Probably the new shares will be issued at a price to provide the allottees with a bonus, but these are not the days in which the prospect of such a pleasant addition to the dividend causes an improvement in the existing quotation, because people are likely to sell the old in order to take up the new. Henleys advanced to 66s. 6d., on the report, though the price subsequently went back to its previous level of 65s. The figures in both cases are excellent and afford some justification for the recent rises that have occurred in the prices of Henleys and Callenders, though the yield on the money, at the current rates of dividend, is very modest. Brush ordinary are ex dividend at 22s. 6d.; English Electrics at 18s. x.d. recovered most of the deduction that was made in the price last Thursday. Metropolitan-Vickers ordinary fell a few pence. Johnson & Phillips recovered without any difficulty the dividend which has been taken off the price.

Home Railways are steady. Districts have risen to 49 upon hopes of a fine Whitsun, and the fact that the Wembley Exhibition seems likely to prove a greater success than some people had anticipated.

Babcock & Wilcox strengthened to 2½, the iron and steel group as a whole presenting a less dolorous appearance. There has been a little buying of the leading shares, on the idea that the slump in this particular group has gone far enough, if not too far, and that the existing prices, especially of shares in the good companies, discount the depression which prevails in the trade at large.

The cable market is uninteresting. Eastern ordinary recovered the 2 points that it shed ten days ago, but Western at 17 are 5s. lower. Anglo-American deferred is a little harder, and Chili Telephones at 5 9/16 are 2s. 6d. up. Marconis remain very passive. The new shares stand at 31s. 6d. From the point of view of the speculative investor, Marconis hold out the attraction of a probable increase in dividend in the future, while there is still the long-expected grant to be made from the Government in respect of war compensation. Popular interest has died out of Marconis for the time being, and the wireless group as a whole is attracting scarcely any interest.

Tokyo Electric Sixes receded 1 to 89, on the news of the latest earthquake in Japan. Brazilian Tractions spurted sharply, the price gaining 3¼ points. Mexico Tramways Common at 16¼ are rather better. In the Indian group, Calcutta Electric at 27s. show a small improvement, and, amongst South Africans, Victoria Falls ordinary at 42s., the preference at 32s., have eased off a trifle in company with the prices of shares in various gold-producing companies. The rubber share market, after the violent excitements of last week, is quieter, and some of the leading descriptions have fallen back from their recent best prices.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price May 25 1925.	Rise or fall.	Yield. p.c.
Bournemouth and Poole ...	1	13	14	2⅛	—	4 19 7
Brompton Ordinary	1	10	10	1⅞	—	*5 14 3
Charing Cross Ordinary	1	14½	15	46/3	+6d.	6 9 9
do. do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	12	1¼	—	6 8 0
City of London	1	15	15	47/-	+9d.	6 7 8
do. do. 6% Pref. ...	1	6	6	23/6	—	5 2 2
Clyde Valley	1	8	8	32/6	—	4 18 6
County of London	1	15	15	2⅞	—	5 9 1
do. do. 6% Pref. ...	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	—	23/6	—	5 19 0
do. 7% Pref.	1	6	—	23/-	—	6 1 9
Elec. Supply Corporation ...		10	10	33/8	—6d.	6 0 4
Kensington Ordinary	5	14	15	12⅜	—	5 16 6
Lancs. Light and Power ...	1	7½	7½	27/-xd	—	5 11 1
London Electric	1	10	10	34/6	—	5 15 11
do. do. 6% Pref. ...	5	6	6	5⅜	—	5 6 8
Metropolitan	1	10	11	38/3	—	5 15 0
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	24/3	—	4 19 0
Newcastle-on-Tyne Ordinary ...	1	6	7	1⅜	—	6 13 4
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	25/6	—	5 9 10
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref. ...	1	6	6	1¼	—	5 6 8
St. James' and Pall Mall ...	5	17½	17½	13⅜	—	6 8 8
South London	1	15	15	2½	—	6 0 0
South Metropolitan Pref. ...		7	7	1⅜	—	5 12 0
Urban Ordinary	1	4	4	17/6	—	4 11 5
do. 6% Pref. ...	1	6	6	20/-	—	6 0 0
Westminster Ordinary	1	15	15	45/6	+1/-	6 11 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19/6	—3d.	7 13 10
Yorkshire Elec.	1	8	8	31/-	—	5 3 3

HOME RAILS.

Central London Ord. Assented Stock	4	4	69	—	5 15 11
Metropolitan ... ... ,,	4	5	76½	—	6 12 5
do. District ... ... ,,	3½	3½	40	+ ½	7 2 10
Underground Electric Ordinary	10	Nil	Nil	2⅞	—	Nil
do. do. "A" ...	1/-	Nil	Nil	8/-	—	Nil
do. do. Income	Bonds	6	6	97	—	*6 3 9

TELEGRAPHS AND TELEPHONES.

		Dividend. 1922.	Dividend. 1923.			
Anglo-Am. Tel. Pref.	Stock	6	6	105	—	5 14 3
do. Def.	,,	1½	1½	24⅝	+ ⅛	6 3 1
Automatic Telephone	1	Nil	3	2	—	3 0 0
Chili Telephone	5	6	6	5⅛	+ ⅛	*5 7 10
Cuba Sub. Ord.	10	7	5	6¼	—	7 5 6
Eastern Extension	10	10	10	17½	—	*5 12 8
Eastern Tel. Ord.	Stock	10	10	177½	+2	*5 12 8
Globe Tel. and T. Ord.	10	10	10	18	—	*5 11 1
do. do. Pref.	10	6	6	11½	—	5 7 10
Great Northern Tel.	10	24	22	82	—	6 17 6
Indo-European	25	7	7	41½	—	*4 4 4
Marconi	1	15	10	1⅛	—	5 19 7
Marconi Marine	1	10	10	1⅜	—	8 17 10
Oriental Telephone Ord. ...	1	12	12	2½	—	*5 16 3
United R. Plate Tel.	5	8	8	7⅛	—	*5 13 3
Western Telegraph	10	10	10	17	— ¼	*5 17 9

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	12½	5½	8½	—	8 9 2
do. do. 2nd Pref. ...	5	5½	6	2⅝	—	10 7 10
do. do. 5% Deb. ...	Stock	5	5	73xd	—	6 17 0
British Electric Traction Ord. ...	,,	5	6	112½	—	5 5 0
do. do. 6% Pref. ...	,,	6	6	107½	—	5 11 7
Brazil Traction	100	4	4	55½	+2½	7 4 2
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	89½	—	5 11 9
do. do. Preferred	,,	5	90/-	89⅜	—	*5 7 3
do. do. Deferred	,,	8	129/5	107½	—	*6 0 6
do. do. Deb.	,,	4½	4½	77⅛	—1	5 9 8
Lond. & Sub. Trac. 5% Pref. ...	1	5	2½	6/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	47½	—	8 8 5
Mexico Trams, 5% Bonds ...	—	Nil	5	66	—	7 11 6
Mexican Light Common ...	100	Nil	Nil	27	—	Nil
do. Pref.	100	Nil	Nil	61	—	Nil
do. 1st Bonds ...	—	5	5	67½	—	7 8 2
Yorkshire (West Riding) ...	1	—	5	18/9	—	5 6 8

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	20	12	2⅜	+ ⅛	*4 8 1
British Aluminium Ord.	1	5	5	82/6	—	3 1 6
British Elec. Transformer Pref.	1	Nil	Nil	17/o	—	... ...
British Insulated Ord.	1	15	15	3⅛	+ ⅛	4 10 3
Brush Ord.	1	10	10	22/6xd	—	8 17 10
Callenders	1	15	15	3⅛	— ⅛	4 10 7
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord	1	5	Nil	⅜	—	... ...
Edison-Swan	4/-	7½	10	7/9	—	5 1 7
do. 5% Deb.	Stock	5	5	82½	—	6 1 3
Electric Construction	1	10	10	33/9	—	5 19 10
Enfield Cable, Pref.	1	7½	7½	1⅛	—	6 0 0
English Electric	1	8	5	18/-xd	+9d.	5 11 1
do. do. Pref.	1	6	6	21/-	—	5 14 3
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	5	5	23/9	—	4 4 3
Henley	1	15	15	3½	—	4 12 4
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	10	5	1⅜	—	*4 8 11
Johnson & Phillips	1	5	10	1¼xd	+1/6	5 10 4
Met-Vickers, Ord.	1	12½	8	23/3	—6d.	6 17 8
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	5	—	27/-	—	5 14 0
Telegraph Construction	13	20	20	17	—	*4 14 1

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price May 26.	Fortnight's Inc. or dec.
a Acid, Oxalic ... ... per lb.	6¾d.	...
a Ammoniac, Sal ... ... per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£25	...
a Copper Sulphate ... ... ,,	£25 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a ,, Perchlorate ... ... ,,	5½d.	...
a Shellac ... ... per cwt.	£15 15s.	...
a Sulphur, Sublimed Flowers ... ,,	£7 15s.	...
a ,, Roll ... ... ,,	£7 15s.	...
a Soda, Chlorate ... ... per lb.	3¼d. to 3½d.	...
a ,, Crystals ... ... per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots ... ... per ton	£120 to £125	...
b ,, Wire ... ... per lb.	1/9 to 2/6*	...
b ,, Sheet ... ... ,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		
Grade I ... ... per ton net	£230	£5 inc.
Grade II ... ... ,, ,,	£164	£4 inc.
Grade III ... ... ,, ,,	£92	£2 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	9¾d.	...
c ,, Tubes (solid drawn) ... ,,	11⅛d. to 1/-	...
c ,, Wire, basis ... ... ,,	9¾d.	...
c Copper Tubes (solid drawn) ... ,,	1/1	...
c ,, Bars (best selected) ... per ton	£90	£1 dec.
c ,, Sheet ... ... ,,	£90	£1 dec.
c ,, Rod ... ... ,,	£90	£1 dec.
d ,, (Electrolytic) Bars ... ,,	£63 15s.	15s. dec.
d ,, ,, Sheets ... ,,	£14 - inc.	
d ,, ,, Wire Rods ,,	£78 15s.	15s. dec.
d ,, ,, H.C. Wire per lb.	9½d.	½d. dec.
f Ebonite Rod ... ... ,,	2/- to 3/6	...
f Sheet ... ... ,,	2/- to 3/6	...
a German Silver Wire ... ... ,,	2/3	...
h Gutta-percha, fine ... ... ,,	8/3	...
h India-rubber, Para fine ... ... ,,	2/2	5d. inc.
i Iron Pig (Cleveland Warrants) ... per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. qual. ,,	£23	...
g Lead, English Pig ... ... ,,	£34	...
g Mercury ... ... per bot.	£13 12s. 6d. to £13 17s. 6d.	2s. 6d. inc.
e Mica (in original cases) small ... per lb.	3d. to 3/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/8½	...
p ,, ,, drawn bars & rods ,,	1/8	...
p ,, ,, rolled strip & sheet ,,	1/9½	...
p ,, ,, wire ... ... ,,	1/8½	¼d. dec.
o Platinum ... ... per oz.	£36	...
d Silicium Bronze Wire ... ... per lb.	1/0½	...
r Steel, Magnet, in bars ... ... ,,	7½d.	...
n Tin, Block (English) ... per ton.	£253 10s. to £254	£9 15s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	2/10	1d. dec.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd
n P. Ormiston & Sons.
o Johnson, Mathey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Proposed Transport Scheme for Los Angeles.—The *Electric Railway Journal* states that an immediate expenditure of $133,385,000 for the city and county's proposed rapid transit system was suggested by Major R. F. Kelker, Jr., Chicago, in a report made on April 20th to the county and city of Los Angeles. The report is now under consideration by the city and county governments. It recommends the following features:—The construction of subways, elevated lines and open cuts. Immediate unification of the Los Angeles city local transportation system to be operated as one unit, extended to meet the needs of a city of 3,000,000 population. A plan for managing and operating the proposed unified system, as well as plans for providing for the construction of additional transit facilities. The report proposes two extensive subway trunk lines through the down-town business district, with entrances every four blocks. Surface lines and 'bus routes would be increased and used as feeders for the tubes. The scheme proposes the immediate construction of the following track mileage:—Subways and tunnels, 25; elevated and open cut lines, 85.2; street railways, 42. A statement of track mileage of the entire comprehensive transportation system shows 588 miles now existing and under construction, 153 miles to be added immediately, and 233 for future construction, with a unified system of 274 miles, within a radius of 8 miles from the centre of Los Angeles.

Exhibition at Grenoble.—On May 21st an important exhibition of hydroelectric plant was opened at Grenoble, France, which is situated in a district where water-power is very largely utilised. The Minister of Public Works delivered an address, emphasising the importance of the electrification of industry in order to reduce the importation of coal and to help in restoring the normal value of the franc.

Electrically-Propelled Vehicles for Road Transport.

By FRANK AYTON, M.I.E.E.

(*Abstract of paper read before the* INSTITUTE OF TRANSPORT.)

EXPERIENCE has demonstrated that in town and city transport work, in which the electric vehicle gives such satisfactory results, its moderate maximum speed characteristic is not a disadvantage because the feature of rapid acceleration gives to the electric vehicle remarkable manœuvring power in traffic which enables it to get from point to point quite as quickly as other motor vehicles. The ability to reach high speed gives little or no advantage in traffic, for there is so seldom any opportunity of employing it—the ability to get away quickly is what counts, and this feature the electric vehicle possesses in greater measure than other types.

Electric vehicles are adopted (for any class of transport service) on account of certain distinct advantages which they possess, the most important being economy in cost of operation. In supporting this claim the practice has sometimes been adopted of giving comparative estimates for electric, petrol, and steam on the basis of different annual mileages, but the author declines to adopt this course for he believes that such figures fail to carry conviction. He holds that it is more convincing to quote the opinions of users, based upon actual experience. Each year witnesses an increased number of "electrics" put into service. Considerable interest in the electric vehicle has manifested itself in France, and it is noteworthy that some of the well-known French constructors of petrol cars have quite recently taken to the production of "electrics." Activity in this field is also exhibited in Italy and Germany.

In some quarters there is, seemingly, still the impression that batteries are unreliable; those made by reputable manufacturers are reliable, satisfactory, and moreover give reasonably long life. Two distinct types are in use: One is the lead-acid battery and the other the nickel-iron-alkali battery, of which the Edison, "Ni-fe," and "Ionic" are examples. The latter type possesses longer life and is more fool-proof, but its cost is considerably in excess of that of the lead-acid type. If proper care is bestowed upon the charging operations, and the batteries are kept in good condition, satisfactory and economical service may be expected from either type. Allowing for depreciation on the basis of the life guarantees given by the makers of the respective types, it will generally be found in practice that the all-in operating costs are about the same, whichever type is employed. The makers of the lead-plate battery most used on electric vehicles, *i.e.*, the Ironclad-Exide, give a guarantee covering two years. This guarantee is a very conservative one, for the author has a record of the life of each battery of that make used on 19 electric lorries supplied by the author's firm to different customers. The average battery life obtained was, for the 19 vehicles, 3 years and 9 months. The longest life recorded was 5 years and 3 months, while the shortest was 3 years. Another lead-plate type which has given satisfactory results on electric vehicles is the "Kathanode" made by the D.P. Battery Co. The makers of the Edison battery guarantee it for 8 years, or 60,000 miles, and a guarantee of 4 years is given in the case of the "Ni-fe" make. Excellent results on electric vehicle work are obtained with both these makes of battery, but satisfactory service is made or marred in the garage; where "electrics" have failed to give satisfaction in recent years, the cause may generally be traced to lack of proper care and attention of the batteries after the day's work on the road, assuming, of course, that the class of work which the vehicles were called upon to perform was suitable for "electrics."

The establishment in towns and cities of public electric vehicle charging stations with garage accommodation would do much to encourage and further the use of electric vehicles. American electricity companies, recognising the remunerative character of the supply, have made it easy for electric vehicles to be charged and cared for. Some of our municipal undertakings have exhibited commendable enterprise on similar lines, but there is much more that could be done. Our municipalities are, however, users of "electrics" in considerable numbers in their cleansing departments, and in this class of work, *i.e.*, refuse collection, the "electric" has proved an ideal machine and the cheapest to employ, except for very short collection journeys in connection with which the horse-drawn vehicle remains the most economical. Mr. J. Dawes, Chief Inspector of the Ministry of Health, computes that at the present time refuse collection in this country involves the use of 8,000 horses and 2,000 power-propelled vehicles, so that there is considerable scope yet for displacing horses by the type of motor vehicle best suited for the special nature of the work.

The use of "electrics" for refuse collection has made possible a saving, as compared with collection by horses, of nearly 2s. per ton at Norwich and 3s. per ton at Blackpool, and an interesting example of the reliability of electric vehicles in this somewhat trying kind of service are the results recorded in connection with the fleet belonging to the Willesden Urban District Council; the figures refer to a total of 14 vehicles of 2½ tons capacity:—

Year.	Percentage of time lost to total working hours.
1921	0.3
1922	0.15
1923	0.095
1924	0.11
1925	0.14

The use made of the small electric industrial truck in and about factories, wharves, docksides, warehouses, and railway depôts is rapidly extending, due to the great savings in time and money which experience has shown can be brought about by their employment wherever the conditions are suitable. In many instances the savings resulting from the use of a single truck have more than wiped out its initial cost within the first twelve months, and by special design and construction and the addition of a crane and an elevating or tiering platform, the electric truck is made applicable to every class of duty in moving and handling goods and materials over short distances. There can be no question that one of the most potent means of reducing the cost of goods handling lies in the employment of electric trucks.

The trolley vehicle has been applied so far only to passenger carrying service, although the Bradford Corporation Tramway Department has been using a trolley vehicle equipped also with a battery, the latter being brought into operation when the vehicle (which was employed for carrying goods) had to leave its usual routes and proceed along roads not fitted with trolley wires. Trolley 'bus undertakings exist to-day in 14 different places; with one exception, the undertakings belong to local authorities, and in most cases are operated in conjunction with tramways which, in many instances, they serve as feeders, or else work on routes where traffic is light, so that frequently the actual working of the system, for these reasons, fails to show a profit. Nevertheless, it has been demonstrated by experience that the trolley 'bus can be run at appreciably less cost than can a petrol 'bus.

So satisfactory and successful have trolley omnibuses proved where they have been used that many other local authorities owning and working electric tramways, and faced with the nowadays heavy cost of renewing tracks, are considering the question of superseding the rail car by trolley 'buses. Some of them, *e.g.*, Darlington, Chesterfield, Wigan and Ashton-under-Lyne, have definitely decided upon the change. Abroad, we find the Shanghai Tramway Co. arranging to apply this type of motor 'bus in place of tramcars over the whole of its system.

The Corporation Tramway Department at Wolverhampton operates both trolley and petrol 'buses. The power cost per 'bus mile is 1.467d. for the former (with electricity at 1.175d. per kWh), while the figure for the petrol 'buses is 2.429d. Both trolley and petrol vehicles are by the same maker and are up-to-date machines. Repair costs are .691d. and 1.244d. respectively for the trolley and the petrol machines, the former figure including the upkeep of the trolley wires and feeder cables. It is also possible to compare the working expenses of trolley 'buses and petrol 'buses in the same service in the case of the Birmingham Corporation tramways. This department operates 12 trolley 'buses (large top covered double deckers) and 78 petrol 'buses, a considerable number of which are small single deckers for one-man operation. The effect of so many small petrol vehicles on the cost of operation makes the comparison with very large trolley 'buses rather unfair to the latter. Taking power costs per 'bus mile first, electricity costing 1.345d. per kWh, the figure for the trolley 'buses is 2.143d. and for the petrol vehicles 2.353d. Repair costs per 'bus mile are 1.69d. and 2.6d. respectively.

The advantages possessed by the trolley 'bus may thus be stated:—

1. The extremely simple and strong construction of the working parts which makes for reliability and low cost of repair and maintenance.
2. Ability to make use of cheap electric power from a central power station. As there is stability in the price charged for electricity and the trend in price in the future must be downwards, it is possible to forecast with some degree of certainty what the cost of operating any particular service will be over a comparatively long period ahead.
3. A faster and better service can be maintained due to the qualities of rapid acceleration inherent in the electric motor.
4. A longer life for the chassis owing to the absence of reciprocating parts and consequently of vibration.
5. Ease of control, rendering driving an easier matter than in the case of a petrol 'bus.
6. Quiet and smooth running.

The disadvantages are (*a*) the vehicles are restricted in use to the routes along which trolley wires are provided, and (*b*) the higher initial expenditure required to establish a service as compared with petrol 'buses, but when the undertakers go to the expense of erecting trolley wires and laying feeder cables,

the owners of property along a new route will be more likely to develop it, for there is a permanency about the system which is absent in the case of petrol 'buses.

Mr. R. H. Wilkinson, the general manager of the Bradford Corporation tramway, gives the cost of span wire construction with four copper trolley wires (each of 0000 gauge) as £2,540 per mile, including 20 per cent. for contingencies; bracket arm construction, with the same size of trolley wires and contingency allowance, is put at £1,725 per mile. For a route length of two miles or under, route cables—that is to say, cables running parallel with the trolley wires, and feeding the latter every half-mile—would not be required. Beyond two miles the cost of feeder cables would depend upon the density of the service contemplated and the length of the route. Although trolley vehicles are at present confined exclusively to local passenger services, they could quite easily be employed for carrying goods and for handling such transport service from town to town if necessary. It is only a question of providing the standing equipment in the form of posts, supports and trolley wires, feeder cables, &c., and the probability of a sufficient density of traffic to warrant the capital outlay.

Electric vehicles are destined to play a large part in the future in the realm of road transport, especially that transport which is restricted to urban and suburban areas. It is not unlikely that the situation which may develop in the future in connection with the supply of motor spirit may of itself force the more general adoption of electric vehicles. The Board of Trade figures for the import of petrol in 1924 show a considerable increase over 1923, the totals in gallons being 422,310,541 and 327,233,670 respectively. It is only reasonable to anticipate that if this is the rate of increase during a period characterised by depressed trade, the rate of increase will be much greater when trade revives, and that the increased consumption will not be in this country only, but world-wide. Quite apart from whether there will or will not be in the future a world shortage in this commodity, it is obvious that if the consumption of petrol for road vehicles could be largely replaced by an equivalent consumption of electrical energy produced from home-got coal, it would be beneficial to our financial position as a nation and would also be a potent factor in cheapening electricity to all classes of electricity consumers, because it would improve the load factor of the generating stations. There would also be a resulting gain to the amenities of our cities and towns, in many of which the atmospheric pollution by exhaust gases from internal combustion engines is tending to become a serious nuisance, and if the first stage in the more general employment of the "electric" is to be the elimination of horse haulage from our congested and busy streets, the twofold gain will result in a general speeding-up of traffic and an improvement from the hygienic point of view.

Coal-Handling Plant at East Greenwich Power Station.

THE apparatus installed for the expeditious handling of coal at the East Greenwich power station of the London County Council, which has recently been completed, consists of a system of grab transporters and belt conveyors, to unload coal from colliers of about 2,000 tons capacity and distribute it into the bunkers over the boiler house, or alternatively into storage bunkers at the shore end of the pier.

The transporters were supplied by Messrs. Sir William Arrol and Co., and the conveying plant was supplied and erected by the Fraser & Chalmers Engineering Works (General Electric Co., Ltd.). The conveying plant is built in accordance with the latest designs and practice of the Robins Conveying Belt Company, of New York.

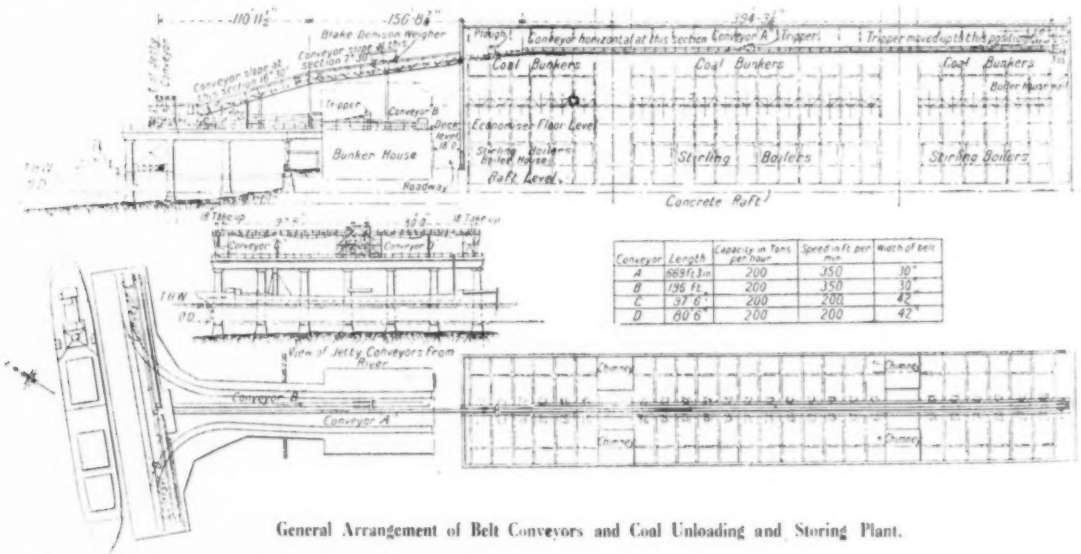
The coal is delivered by the grabs into hoppers attached to the travelling transporters, which load the coal evenly on to two horizontal belts situated parallel to the river on the pier end. Either or both these belts deliver the coal into specially-designed shoots at the top of the crusher house situated at the centre of the pier, whence it can be passed by a system of shoots either to the short horizontal inshore belt to the storage bunkers or by means of a long inclined belt to the bunkers over the boiler house. In the case of coal which is too large for use in the chain-grate stokers, it can, before conveyance to the inshore belts, be passed through either of two Jeffrey single-roll crushers.

The inclined conveyor possesses some interesting features. It has a total length of 669 ft., is 30 in. wide, and raises the coal to a total height of 58 ft. 6½ in., travelling at 350 ft. p.m. The steepest inclination of the belt is 16½ degrees, and both this belt and the belt conveying coal to the storage bunker have an hourly capacity of 200 English tons. The horizontal conveyor to the storage bunker is 196 ft. long, 30 in. wide, and runs at a speed of 350 ft. per minute. The two pier conveyors are 42 in. wide, 97 ft. 6 in. and 80 ft. 6 in. long respectively, and run at a speed of 200 ft. p.m. These belts are wider than the inshore conveyor belts, being designed to handle large coal before it is crushed.

Coal conveyed to the boiler house and bunkers is automatically weighed in transit by continuous belt-conveyor weighing machines, made by Messrs. Samuel Denison & Sons.

The drive of the long inclined belt is placed at the lower end of the conveyor, and consists of two large pulleys geared together and driven through spur gearing from the driving motor. This arrangement gives over 360 deg. actual contact between the driving pulleys and the belt, and reduces the initial tension required to such an extent that the ultimate stress in the belt is reduced by nearly one half, as compared with the older method of single-pulley head drive.

The coal is distributed into the bunkers by means of a tripper, which can be traversed from end to end by the belt



Conveyor	Length	Capacity in Tons per hour	Speed in ft. per min.	Width of belt
A	669ft 3in	200	350	30"
B	196 ft.	200	350	30"
C	97'6"	200	200	42"
D	80'6"	200	200	42"

General Arrangement of Belt Conveyors and Coal Unloading and Storing Plant.

Each pier conveyor is driven by a 6-h.p. motor, the inshore conveyor to storage bunkers by a 16-h.p. motor, and the long inclined belt by a 50-h.p. motor. These are standard "Witton" motors which, together with the starting apparatus, were supplied by the G.E.C.

When working with both transporters the plant has a total rated capacity of 200 tons per hour, which, however, has been considerably exceeded in actual practice.

The whole of the belting ("Durabelt") is of stepped ply construction, and consist of plies of specially-selected cotton duck bonded together by a solution of high-friction rubber compound, giving a separation test on a piece 1 in. wide, of 25 lb. pull at 1 in. p.m. The body of the belt is enveloped in a rubber cover, the compounding of which has been determined by actual practice on heavy material.

Swiss Conditions in 1924.

Official Review of Electrical Progress.

A REPORT upon the economic and financial conditions in Switzerland during the past year has been forwarded to the Department of Overseas Trade by Mr. R. A. C. Sperling, C.B., the British Minister Plenipotentiary at Berne.*

In his introductory remarks, Mr. Sperling says that every available indication points to a steady growth of prosperity in 1924. One marked indication of this tendency was the rapid decline of unemployment which permitted the suspension of relief measures in June last. The growth of confidence was apparent in the higher quotations of securities and the rise in the exchange. The return of the Swiss franc to gold parity reduced the country's debt to the United States by 35 million francs, and the interest service by 2 millions. Definite steps are being taken to cancel the public debt, and it is hoped to reduce the amount to 360 million francs by 1935, when definite arrangements will have been made for its amortisation. The Federal finances are steadily improving.

Foreign Trade.

The imports during 1924 exceeded the exports by fr. 434 million, but this adverse balance was redressed by large "invisible" exports. There was a greater demand for raw materials for the Swiss export industries, and iron was imported to the extent of 383,174 tons as compared with 311,942 tons in 1923. Copper imports rose from 16,700 tons to 21,200 tons; this increase may be attributed partly to the increase in Swiss exports of semi-manufactured goods (principally to France), and partly to electrification work on the Federal Railways. Among other items in the import section which showed an increase was boilers (1,926 tons as against 1,350), of which Germany furnished 1,347 tons (800) and Great Britain 148 tons (61). Although there was a decrease in the imports of dynamo-electric machinery, from 748 to 584 tons, Great Britain's share increased from 51 to 158 tons. Imports from Germany fell from 603 to 282 tons.

On the other side there was an increase in machinery exports, from 44,438 to 52,149 tons. This improvement, however, was somewhat counterbalanced by the "dumping" of large quantities of machinery on the Swiss market; nevertheless, the situation was better than in 1913, when Swiss exports barely exceeded the imports of machinery from Germany. Generating machinery was exported to France, Belgium, Great Britain, Japan and Spain, to the extent of 6,223 tons.

Industry and Production.

Conditions in the Swiss machine industry became more normal in 1924, and railway electrification was responsible for increased activity. Foreign competition appears to be decreasing, although German, French, Belgian and Italian manufacturers are very active. On the whole production is not very remunerative; exporters of machinery still encounter difficulties as the handicap of high costs of production and selling prices cannot be overcome without longer hours and lower wages. These, therefore, are the immediate objects of Swiss manufacturers, in addition to the improvement of equipment and methods of production.

The heavy electrical industry is still affected by high overhead charges. The need for longer working hours and better output is widely recognised, and the adoption in 1924 of the 52-hour week in several works went unopposed. Since the spring of 1924 orders have been more numerous, but the prices quoted would have been unacceptable in ordinary circumstances. During the second half of 1924 the works were really busy for the first time since 1920, though profitable production will be impossible until selling prices are permanently raised. German competition is again being felt and the possible resumption of German "dumping" is not overlooked. In the light electrical industry most branches were well occupied throughout the year although prices had to be kept very low. Export trade is hindered by foreign protective methods. The outlook for the current year is uncertain, as increased German competition is feared. At the close of 1924 various Swiss incandescent lamp works amalgamated with a German-Dutch trust.

Hydro-Electric Development.

A number of important hydro-electric works were completed during 1924, among them being the Chancy-Pougny station on the Rhône, near Geneva, with a capacity of 43,000 h.p.; the Wäggithal Rempen Works (90,000 h.p.); the Siebnen Works (70,000 h.p.); and the extension of the Lungern Works of the Central Swiss Power Co., from 18,000 to 30,000 h.p. At the end of the year there were 46 stations with installed plant exceeding 10,000 h.p. in service in Switzerland, their combined capacity being 1,337,725 h.p. Among the most important developments in course of construction are those at Vernayaz (102,000 h.p.), belonging to the Federal Railways; Davos-Klosters (30,000 h.p.); Illsee-Turtmann (23,000 h.p.); Orsières (15,000 h.p.); and Tremorgio (12,000 h.p.). Further large schemes are projected, the most important being that at Oberhasli, where the Bernese Power Co. is developing 250,000 h.p. in three stages. The Federal Railway authorities have planned stations at Etzel (120,000 h.p.), and Aarau-Wildegg (81,600 h.p.). The Rhaetische Kraftwerke A.G. is to build a 190,000 h.p. plant at Hintershein; and the North-Eastern Power Company projects an 85,000-h.p. station at Boettstein-Gippingen, and, jointly with Escher, Wyss & Co., stations at Wiederschwoerstadt (96,000 h.p.), and Dogern (80,000 h.p.), both on the Rhine. It is stated in the report that unless new works are put into service before long the demand will exceed the supply. The total consumption during 1924 is estimated at 3,125 million kWh, the principal demand coming from industry (817 million kWh), and electro-chemical and metallurgical works (686 million). The demand of the Federal Railways is put at 150 million kWh. Ninety-five per cent. of all Swiss localities (with 90 per cent. of the entire population) are served by electricity works. The exports of power during the year amounted to 464 million kWh. New export regulations came into force in October, 1924, by which a levy of 30 centimes per kWh per year was imposed.

Railway Electrification.

It is significant that out of a sum of 116 millions allocated by the 1925 Budget to the Federal Railways, 41,433,000 fr. is for electrification, 31,714,000 fr. for general construction work, and 30,663,000 fr. for rolling stock. The last amount includes 25 million fr. for the construction of electric locomotives. A further sum of 9 million fr. is set aside for the construction of the Vernayaz works, which is mentioned above. At the end of 1924, the electrified portion of the Federal Railways was 717 km. out of a total length of about 3,000 km. About 300 km. of newly-electrified line was put into service during the past year, and a further 250 km. is in hand. Orders were placed in Switzerland in 1924 for 142 electric locomotives, 8 motor coaches, and 60 bogie passenger carriages, for delivery in 1924-26. The Board of Direction has been authorised to place orders for 68 locomotives and 7 motor coaches with Swiss firms during the current year. The report states that electric traction is proving more advantageous than steam traction, but it will not be possible to gauge its full effects accurately until the entire Federal system has been electrified.

Telegraphy and Telephony.

Telegraph traffic is giving way before the rapid growth of telephony: during 1924 several telegraph lines were converted into long-distance telephone circuits, and numerous telephone trunk lines were put into service. The international telephone service was improved by the opening up of new connections between Switzerland and neighbouring countries; it will be further extended during 1925. The establishment of direct telephone communication between Switzerland and London is under consideration. At the end of 1924 three automatic exchanges were in operation and three others are being opened in a few months.

There are five broadcasting stations, the last, the Zürich-Hoengg station, having been opened in August last. The erection of a radio station at Basle for broadcasting and civil aviation is under consideration, and a Federal subsidy is contemplated for the purpose. The number of licensed receiving sets increased from 1,100 in 1923 to about 17,000 in December 1924; this increase was partly due to the opening of the Zürich-Hoengg station. An international radio exhibition is to be held in September next. The Marconi station at Münchenbuchsee has been equipped with a 15-kW transmitter which uses the same aerial as the 25-kW plant, which has also been improved. The Confederation has acquired a controlling interest in the Swiss Marconi Radio Company.

Trade Prospects and Methods.

Following the usual practice of our overseas representatives, Mr. Sperling gives indications of openings for British goods and advice as to the best way of selling these. He considers that the sales of British-made accumulators, telegraph and telephone apparatus, &c., could probably be increased. The Swiss market could also absorb large quantities of radio goods and offers good scope for enterprising English firms. British radio apparatus is already known to a certain extent and its good quality is duly appreciated, but prices are generally considered too high.

The following "trade points," among others, should be borne in mind if good business is to be done:—Adaptation to local requirements and taste is essential; through quotations, either f.o.r. or c.i.f. and in Swiss francs should always be given if possible; credit terms should follow local custom; correspondence should be in the language of the district addressed; catalogues, too, should be in French or German, and the metric system should be used; Switzerland should be worked by agents resident in the country—in both French and German-speaking parts if possible; the desirability of advertising should not be overlooked. Mr. Sperling says that British commercial travellers are very seldom seen in Switzerland. All goods need considerable "pushing," but success is not beyond the reach of enterprising British firms, provided every effort is made to meet the requirements of Swiss buyers.

* Stationery Office. 2s. net.

The Printing and Stationery Exhibition.

A Review of the Electrical Exhibits.

THE superiority of electrically driving all classes of machinery in the printing trade being generally admitted, it is hardly necessary to stress the flexibility and economy of electrical operation. The valuable advantages of accurate speed adjustment ensures a more regular drive and enables a higher speed to be employed, thus resulting in an increased output and better register; moreover, with individually-driven machines the speed of which is precisely controlled to suit the particular paper, forme, and class of work, the results are much more certain to be of a high quality. Such facts are demonstrated at the International Printing, Stationery, and Allied Trades Exhibition at the Royal Agricultural Hall (May 16th to 30th), where most of the exhibits are motor driven.

Hudson & Stracey, Ltd.

The advantage of apparatus for assisting the drying of printed matter during the actual progress of the work is apparent, especially for work that requires to be folded immediately after being printed. This firm's simple apparatus

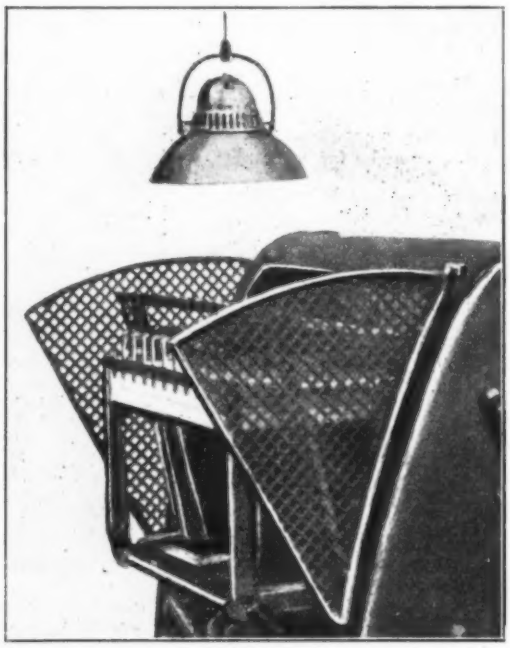


Fig. 1.—Electric Heater for Drying Printed Matter.

can be suspended over any machine having a printed-side-up delivery (fig. 1); it consists of a frame carrying one or more electric radiators very similar to the usual domestic bowl fire. The superiority of this device to the naked gas flame is obvious.

W. Canning & Co., Ltd.

Motor-generators and low-voltage dynamos for the electro-deposition of metals are shown; also vats and chemicals and apparatus for depositing copper on cylinders, with an arrangement for revolving and burnishing the cylinder during the process. Plant for nickel-facing stereos is demonstrated, with a view to lengthening their useful life, the sharpness of the impression being manifest.

City Electrical Co.

Standard a.c. and d.c. motors are on view, in addition to the machines supplied for exhibitors. The company specialises in the supply and erection of motors, ranging from ½ to 300 h.p., on the hire-purchase system.

Swedish General Electric, Ltd.

In association with the Fuller Electrical and Manufacturing Co., a variety of d.c., three-phase, and single-phase motors with control gear is displayed, including an S-type, single-phase, variable-speed commutator motor for driving a 4-roll Miehle flat-bed printing press. This is unusual press-driving equipment; a sufficient speed range for operating flat-bed machines is possible, variation being accomplished by shifting the brush position, and is mechanically controlled by means of a handwheel alongside the laying-on board; push-button control is provided. An oil-immersed, 30-kVA, 3-phase, self-cooled transformer is shown without its tank; connected in delta-star with the neutral point brought out, the 3,460-V primary is provided with 2½ and 5 per cent. tappings, and an extra tapping is included on the 415-V secondary side for 350 volts. A motor-generator set, comprising a K9 d.c., shunt-wound, interpole, constant-speed motor coupled direct to a G7, 3-phase, 15-kVA, 400-V, 50-cycle, 1,000-r.p.m. alternator with a directly-coupled exciter is also to be seen on the stand of the Victory Kidder Co., converting the 200-V d.c. exhibition supply into 3-phase energy.

Electromotors, Ltd.

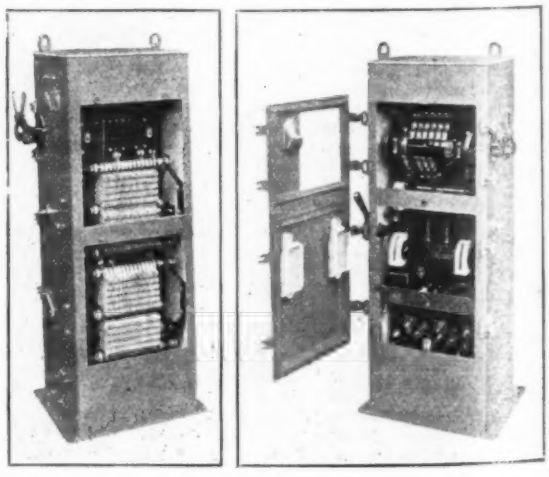
In addition to a number of typical motors and switchgear, this firm exhibits complete equipment for operating a rotary press on its well-known "Gem" system. The plant consists of a 30-h.p. main driving motor, an auxiliary motor-generator which provides the barring current, and a fully automatic control panel.

J. H. Holmes & Co.

This company's main exhibit consists of a model of the Holmes-Clatworthy two-motor equipment for driving rotary web printing presses, which enables machinery to be started smoothly from rest and evenly increase to full speed without paper breakages. In conjunction with it a full-sized automatic controller is shown entirely operated by push buttons, which illustrates a refinement for rotary presses. Other exhibits include small direct and a.c. motors and switchgear; resistances for printing press controllers, &c.

British Thomson-Houston Co., Ltd.

Included amongst the electrical equipment exhibited by this company is a variable-speed motor of the polyphase a.c. type with push-button control; hand-operated controllers with their wasteful resistances are dispensed with entirely, while the most delicate speed control over a range of 3 or 4 to 1 is obtained at high efficiency and with a good power factor, approximately unity at the maximum speed. Owing to the smooth acceleration from creeping to printing speed, under all conditions, "snatch" is eliminated, and wastage of paper at low-speed periods during which faulty impressions are liable to be produced, is a minimum. At any setting the speed remains practically constant, however the load may vary, and the horse-power developed is directly proportional to the speed throughout the range. The motor exhibited is rated at 25/8 h.p., 1,400/450 r.p.m., 400/440 volts, three-phase, 50 cycles, a pilot motor effecting the speed variation by movement of the brush system. In the control equipment section of this company's exhibit, reference should be made to the new drum starting pillars for d.c. or a.c. induction motors, figs. 2 and 3. The arrangement consists of a drum starter with controller-



Figs. 2 & 3.—B.T.-H. Drum Controller : Back and Front Views.

type fingers, resistances, contactor circuit breakers with an improved form of blow-out and fitted with overload relays; double- or triple-pole, double-break, isolating switch; interlocks; simple wiring and cable outlets for screwed conduit, the whole being mounted in a sheet-steel case. A slow-motion device prevents starting too rapidly, and to ensure that resistance is not left too long in circuit, an interlock, which is closed when the starting handle is gripped, keeps

the contactors closed between the "start" and "run" positions, where other interlocks form retaining circuits. If the handle be released in intermediate positions the contactors will open, and cannot reclose until the controller cylinder is brought back to the "start" position. A feature is that the contactors cannot be held closed when passing from the "run" to the "off" position. Terminals are provided so that remote push buttons can be fitted.

In addition there are also shown several types of lighting fittings, including "Glassteel" diffusers, "Trutint" colour-matching units, fans and a "Tungar" battery charger.

Witton-James, Ltd.

This firm's line of plant and switchgear includes a 40-h.p. d.c., two-motor, variable-speed rotary web press driving outfit with full automatic push-button control; a 6-h.p. semi-automatic equipment for job presses and similar drives, matrix mangle driving outfit, safety timing and signalling device for rotary web presses, individual unit brakes for rotary web presses, reel hoist driving outfit, with under- and over-wind limit switches, and sundry automatic switch control apparatus.

Monometer Manufacturing Co. (1918), Ltd.

Besides printers' melting furnaces, an electric heater for typesetting machine pots was noticed, with an automatic temperature controller and a time switch.

A. W. Penrose & Co., Ltd.

Amongst this company's photo-process requisites, in connection with a large photo-litho camera outfit, a set of "Repri" open-arc lamps are shown which are particularly suitable for colour work; the four lamps being in series and working through one resistance, they are economical. A face-up vacuum printing frame of large size and a power-driven, electrically-heated whirler are exhibited, as is also a drying cupboard with a fan and electric heater.

Electrical Progress at Shanghai.

We have again received from Mr. T. H. U. Aldridge, M.I.E.E., the engineer-in-chief and manager of the Shanghai Municipal Electricity Department, a copy of his annual report, covering the year 1924. It is stated that the year was characterised by acute trade depression and by inter-provincial warfare in the immediate vicinity of Shanghai, causing the paralysis of many business and industrial activities. Nevertheless, the sales of electricity rose from 272,255,861 to 307,307,401 kWh—an increase of nearly 13 per cent. The maximum demand rose to 63,459 kW, representing only a small increase, but the load factor improved to 55.12 per cent. from 49.42 per cent. in 1923. An interesting comparison is made in the report of the Shanghai undertaking and the four principal United Kingdom undertakings. These had an average load factor of about 28 per cent. in the nearest comparable year. The Manchester figure was 30.79 per cent., which was far below the Shanghai load factor mentioned above; the energy sold by Manchester was 222,203,023 kWh, and the maximum demand was 108,320 kW.

The unsettled conditions led to a slackening of the rate of increase in the industrial demand. On the other hand, the increase in the sale of electricity in relation to the connected demand indicated a very satisfactory state of affairs, the load factor being exceptionally high, which enabled the Department to supply electricity at very favourable rates.

The installed capacity of the Riverside power station* at the end of the year was 131,000 kW, this figure including the 20,000-kW turbine destroyed at the end of 1923 and now in process of replacement. During the year the Fearon Road generating station was completely dismantled, and the work of converting it into a central stores was commenced.

The total revenue from the sale of energy, motor rentals, &c., was taels 9,227,027 (£1,384,054), and the gross profit (after allowing for depreciation, was taels 3,164,337 (£474,650). After providing for interest on loans and other charges there was a net profit of taels 1,464,162 (£219,624). A balance of £2,822 is added from the previous year's accounts, making £222,446, and this total is allocated as follows:—To general reserve, £33,750; to general municipal funds, £135,000; to special reserve for writing down capital, £52,500; leaving £1,196 to be carried forward. A total of £699,000 has been contributed by the undertaking to the general municipal funds since 1916. The detailed statistics show that the production cost per kWh fell from 2.11 candareens to 1.97 candareens, while the income per kWh decreased from 3.15 to 3.00 candareens. The capital account shows an expenditure of taels 1,502,468 during the year, bringing the total to taels 30,476,330 (£4,571,450).

We reproduce herewith one of the illustrations which are included in the report showing a Shanghai cotton mill containing 104 7.5-h.p. motors, each driving 400 spindles (a total of 41,600). This is a part of the important industrial load connected to the Department's mains.

* Described in our issue of July 4th, 1924 (p. 22).

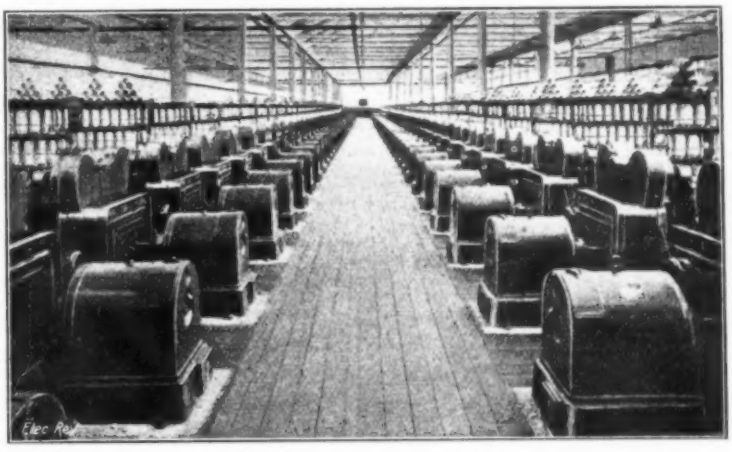
Parliamentary.

[By Our Special Parliamentary Reporter.]

Horley District Gas Company (Electricity Supply) Bill.—The Bill promoted by the Horley District Gas Co., to empower it to supply electricity in Horley (Sussex), and to run an electricity undertaking in conjunction with its gas undertaking, was rejected by a Committee of the House of Commons (presided over by Major Malone) last week. It had already passed the House of Lords, and the proceedings there were reported in our issues of March 27th and April 3rd and 10th.

There were two competing schemes for the supply of electricity in Horley, one by the Gas Co. and the other by the Horley and District Electricity Supply Co., Ltd., which was formed for the purpose. The Gas Company claimed that it could supply electricity in Horley more cheaply than the Electricity Co., inasmuch as it had directors, staff and workmen who could be employed in the two undertakings; it could also reduce overhead charges by running the two undertakings in conjunction, and could raise money more cheaply. The outstanding feature of its proposal was that surplus heat resulting from the gas manufacturing process could be used for raising steam to generate electricity, and the electricity generating station would be on the gas works site. The Electricity Co., on the other hand, suggested that the Gas Co. only applied for electricity supply powers because it had heard of the movement to form the Electricity Co., and wished to have those powers in order to avoid active competition with gas. In the course of the proceedings in the House of Commons, it was stated on behalf of the Electricity Co. that it had arranged for a bulk supply from the County of London Electric Supply Co., whose mains terminated a few miles from Horley, the terms being £6 per kW per annum, plus a running charge of 0.75d. per unit. The Gas Company held the view that it would be three years before a supply could be given in Horley under that scheme, whereas, if the Bill were passed, the Gas Company was bound to supply electricity within one year.

During the proceedings, SIR HARRY HAWARD (one of the Electricity Commissioners) gave the views of the Commissioners on the question of granting powers to gas companies to supply electricity. He said that they did not oppose it on principle, because in some cases it might be the right and proper thing to do, where there was no other body existing which was willing and able to take on the supply. They recognised, however, that on general grounds it was preferable that the supply of electricity should be in the hands of a body whose primary duty it was to supply electricity, where there was such a body able and willing to undertake it. At the same time, it must not be supposed that in every case the Commissioners would think that an electricity company should be entrusted with the powers in preference to a gas company, because there might be cases in which the scheme of a gas company would show overwhelming advantages over the scheme of a competing electricity company.



An Electrically-driven Cotton Mill at Shanghai.

Low-Temperature Carbonisation.—On May 15th, Colonel LANE-FOX informed Mr. Clarry that no close investigation of the Freeman process of low-temperature carbonisation had been

made, but the plant at Willesden was inspected by Sir George Beilby, the late Director of Fuel Research, in 1922. Negotiations had been taking place with a view to the possibility of a test being conducted on this process, but up to the present no definite application for such a test had been submitted by the parties interested.

Private Bills.—The Uckfield Gas and Electricity Bill has been read a third time and passed in the House of Lords. The South Wales Electrical Power Distribution Company Bill has been read a third time and passed in the House of Commons.

Powdered Coke as Fuel. — On May 15th, Mr. CLARRY asked the Secretary for Mines if the Fuel Research Department had made any experiments in the use of powdered coke as an industrial fuel; if so, with what result; and, if not, would he give the question his consideration.

Colonel LANE-FOX said that some preliminary experiments with coke containing between 8 per cent. and 10 per cent. volatile matter had been made. No difficulty was experienced in burning this type of fuel in powdered form. No experiments had been made with coke of lower volatile content.

Rights of Gas Companies.—On May 18th, Mr. LOOKER asked the Minister of Transport whether he would give an undertaking that, under the scheme of general electrification contemplated by the Government, the rights and undertakings of existing gas companies would be duly protected.

Lt.-Col. ASHLEY said the Government's proposals in this matter had not yet been formulated. At present, therefore, it was impossible to say whether any questions would arise under the last part of the question.

Empire Wireless. — On May 19th, Sir WM. MITCHELL-THOMSON, the Postmaster-General, informed Sir H. Brittain that he was not yet in a position to announce the *personnel* of the permanent Committee on Imperial Wireless Services as several of the Dominion Governments had not yet nominated their representatives. The Committee would be of an advisory character and would deal with such questions as the hours of working, routing of messages, tariffs and the classes of service to be operated by the "beam" stations.

Shortage of Telephone Wire.—On May 19th, Mr. WOOD asked the Postmaster-General if he was aware that there was a shortage of wire suitable for making telephone circuits, and that this shortage was causing delay in the installation of new lines.

SIR WM. MITCHELL-THOMSON said that where delay occurred in the provision of telephone circuits, it was usually due, not to any shortage of wire, of which there were ample supplies, but to the time necessarily required for the construction and laying of new cables or the manufacture of exchange equipment.

Admiralty Electrical Engineers.—On May 19th, Mr. DAVIDSON, Parliamentary Secretary to the Admiralty, informed Mr. Hore-Belisha that the salaries paid to electrical station engineers serving under the Admiralty were the same as those paid to other grades in the Dockyards, whose duties and responsibilities were regarded as comparable. Comparisons with the salaries payable in the electricity supply industry could not readily be made owing to the fact that while electrical station engineers were all pensionable and were assured of continuity of employment, those conditions of service did not apply to outside undertakings.

Further asked by Mr. HORE-BELISHA whether he was aware of the dissatisfaction existing amongst senior electrical-station engineers and electrical-station engineers, respectively, at the delay in announcing the post-war complements, and whether, in view of the fact that this matter had been outstanding for over two years, he could see his way to expedite a decision. Mr. Davidson said that he was aware of the dissatisfaction which existed among those officers on account of the delay which had occurred in announcing the post-war complements. The latter were, however, now under consideration and an announcement would be made as soon as possible.

Electricity Districts. — On May 21st, Col. ASHLEY informed Mr. Harris that 16 Electricity Districts had been either provisionally or finally determined by the Electricity Commissioners under the Electricity (Supply) Acts. Parliament had approved schemes setting up Joint Authorities or Joint Advisory Bodies in five cases, and also another scheme of re-organisation for a district where the establishment of a central authority was found to be unnecessary. Two further schemes, each providing for a District Authority, had been approved by the Commissioners and the Orders embodying the schemes had been submitted for confirmation.

Walsall Corporation Bill.—The Local Legislation Committee of the House of Commons resumed consideration of this Bill (see our last issue) on May 21st. Mr. HARKER, for the promoters, said they could not undertake to purchase the light railway between Crescent Road and Bull Stake, Darlaston; it would be uneconomic.

Mr. MONTGOMERY, for the tramway company, said that his clients would sell the line from Bull Stake, Darlaston, to Willenhall Market Place on arbitration terms.

The CHAIRMAN (Sir Thomas Robinson) suggested a "round-table" conference between the parties. This was accepted, and the Committee adjourned until May 26th.

Electrical Development.—On May 21st, on the vote for the Ministry of Transport, Col. ASHLEY said that, whatever the reason was railway electrification was not making the progress he should like, except on the Southern Railway. This railway had in execution a substantial programme of electrification, which he understood would be completed by the end of July. The Government hoped to introduce legislation to develop electricity by increasing the supply and cheapening it. In his opinion, the industrial future of this country might depend on this legislation. But it must not be supposed that the Electricity Commissioners, with their restricted powers, had not been doing a great deal of good work in the last five years. They had sanctioned no less than £60,000,000 of new capital in connection with electrical development. In January he had the good fortune to secure the services of three eminent gentlemen to take part in an examination of the whole question of electrical development. The chairman was Lord Weir and the other members were Lord Forres and Sir Hardman Lever. Their complete report only reached him on May 20th. In the circumstances he could make no statement of the policy of the Government, but it meant to approach the matter on bold and broad lines and its consideration of electrical development would be governed by the single idea of making the supply as plentiful and as cheap as possible.

In the debate which followed, Mr. LLOYD GEORGE expressed disappointment at this statement and asked for further information. Other countries which were our competitors had during the last few years devoted great energy and skill to the development of electricity. France had developed her power 4½ times, and by 1927 would have saved 20,000,000 tons of coal. Germany was doing the same thing. The last report of the Electricity Commissioners made it clear that they felt that without compulsory powers they could not go further. Did the Government propose to deal with that matter?

Mr. SNOWDEN believed that cheap power was going to be a great aid towards cheap production. But we could not get a great scheme of electrical development unless we were prepared to spend money on it.

Sir R. HORNE, after remarking that the two most important topics of the time were transport and power, denied that the railways were slow in considering the advantages that might be derived from electric power. He believed that they were striving to reduce the cost of transport, particularly by the use of electric power. It must be remembered that there were many railways which were better served by steam than by electricity. The real criticism of our electrical development was that we started on the wrong lines, in allowing small municipalities to start electrical development on lines that were not very scientific, and, in many cases, unsuccessful. Some system must be devised by which larger central stations would supply energy in bulk to many stations which were to-day producing, and make them distributing centres.

Lt.-Col. MOORE-BRABAZON, Parliamentary Secretary to the Ministry of Transport, assured the House that when the Government had considered the report of the Weir Committee it would produce legislation very quickly. No country was better equipped for the production of cheap electricity than ours. Incidentally, he mentioned that the preliminary investigation had gone to confirm the opinion of Sir John Snell that the Severn barrage scheme should be proceeded with, and in the future it was hoped to obtain 200,000 kW from this source.

Sir H. JACKSON, a member of the Advisory Committee on London Traffic, said it was the opinion of the Committee that the tramway services were of vital interest to the country, and the cut-throat and unlimited competition between tramways and omnibuses must cease. The Advisory Committee had come to the conclusion that there would have to be further restrictions of trams, omnibuses and electric trains, and they proposed, under the ægis of the Ministry of Transport, to invite these great interests to confer and agree to what extent that restriction could take place. A sub-committee of the Advisory Committee would meet almost immediately to consider the question of three new tubes for the North-East and North, the South-East, and the East of London. The Committee also had before it schemes for a new tunnel under the Thames, a new tunnel under Piccadilly, the question of the Haymarket, and a new road to the docks.

Wireless Supplies.—On May 21st, Mr. ALEXANDER asked the Postmaster-General whether he was aware that the National Association of Radio Manufacturers was threatening to withhold supplies of apparatus from traders who, having made all necessary allowances for costs and profits, might be willing to sell the apparatus at a lower figure than a minimum price fixed by the association.

SIR W. MITCHELL-THOMSON said he had no knowledge of any such action on the part of the Association, and in any event, he had no power to intervene.

Middlesex County Council Bill.—On Monday, May 25th, the House of Commons Committee which has been considering this Bill (*vide* our last issue, p. 839), decided that, where a separate tramway track is laid in the centre of a road, the carriageway on either side must be at least 26 ft. wide; and where the track is on the side of the road, the carriageway must be at least 52 ft. wide. The provision of a separate tramway track, however, is to be subject to the approval of the Minister of Transport.

The Wireless Telegraphy and Signalling Bill.—On May 25th, Mr. BALDWIN, the Prime Minister, informed Mr. Forrest that in view of the decision to hold a general inquiry into the broadcasting system towards the close of the year, the Government had decided not to proceed this session with the Wireless Telegraphy and Signalling Bill. A short Bill would be introduced instead, with the single object of resolving any doubt as to the validity of the existing licence system.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

H.p. Change-Over Earthing Switch.

A single pole change-over earthing switch has been designed for disconnecting and earthing overhead lines and railway sidings during loading operations, by the BRITISH INSULATED AND HELSBY CABLES, LTD., Prescot. The switch is insulated for 3,000 volts d.c., and acts as an isolating switch and earthing link. It is operated by a rod and lever mechanism, insulated

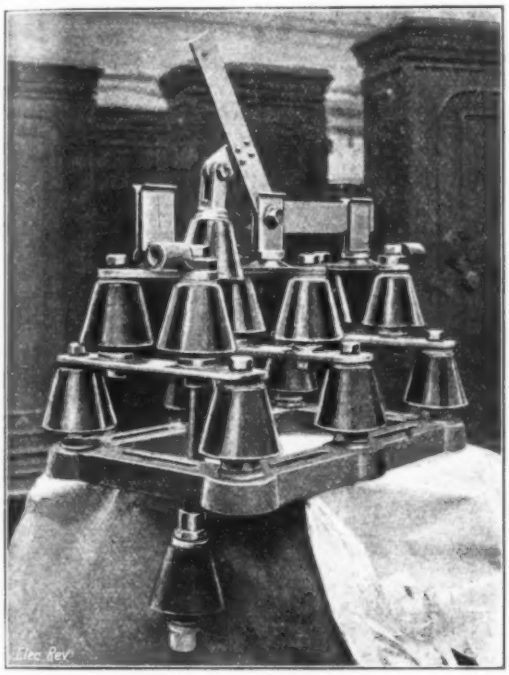


Fig. 1.—Earthing Switch used on G.I.P. Bombay Contract.

from the switch itself by double porcelain insulation. A similar type of switch is used as a section insulator, the switch mechanism being locked in one of three positions, "on," "off," and "earth"; the middle position being the "off" in which both ends of the blades clear of the contacts. The switch illustrated in fig. 1 was used on the G.I.P. Bombay contract for earthing overhead lines in goods yards.

Combination Electric Motor and Pump.

The illustration in fig. 2 is of a novel design of centrifugal pump and electric motor arranged in a single framework and mounted on one bedplate only, lending itself particularly for use as a portable pumping set.

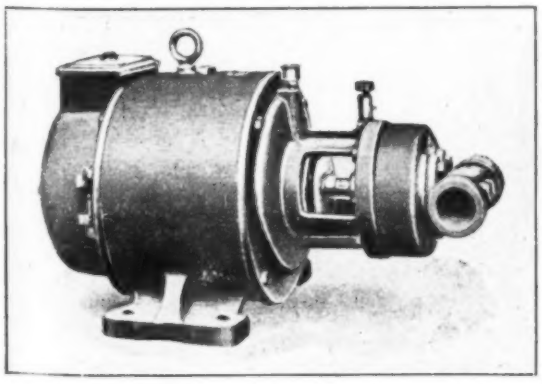


Fig. 2.—The "Mopump" Combination Motor and Pump.

The pump is carried directly from the body of the driving motor by a stiff casting, and has the great advantage of permanent alignment. The pump, which is carried on an extension of the motor shaft, has no bearings, the motor being fitted with special ball bearings.

This combination, the "Mopump," which is marketed by the makers, MESSRS. RHODES, BRYDON & YOUATT, LTD., Waterloo Road, Stockport, is made in sizes varying from capacities of 500 to 15,000 gal. per hour, the motors being suitable for operation on either a.c. or d.c. supplies for the smaller sizes. For sizes above 2,500 gal. per hour capacity, separate motors are supplied according to the supplies on which they are required to operate.

The makers claim that the "Mopump" is suitable for circulating hot water against low heads, as in heating or domestic supply systems, where the static head does not exceed 100 ft. and the actual head pumped against is the frictional resistance of the pipes.

Chain Pendant for Electric Light Fitting.

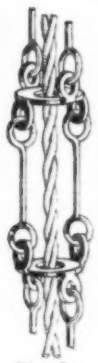


Fig. 3.—Portion of Chain showing Link and Disk Construction.

A novel design of chain pendant for electric light fittings is being put on the market by the UNIVERSAL CENTRAL WIRING CHAIN CO., 13, Ryland Road, Sparkhill, Birmingham. The construction of the chain is illustrated in fig. 3. Round disks each with a hole in the centre and four lugs on the edge, two turned down and two up, form the means of connection between the bar links, with the result that the flexible wire can take a straight path through the centres of the disks.

The pendant is made in two types, A and B, the main difference being in the size of ceiling connection. In both types the connection to the lampholder is made by means of a nipple screwed into the holder, the bottom chain disk supporting the nipple by means of a collar on the nipple. The pendant is supplied complete with lampholder and gallery where required. The whole pendant is of brass and can be finished oxidised copper or silver.

The link eyes can be opened easily with a pair of pliers in the case of lengthening or shortening the chain.

Self-Regulating Vehicle Lighting Set.

The accompanying illustration, fig. 4, is of the dynamo of a new 12-V self-regulating generating set, designed for installation on and the lighting of public vehicles, which is a recent product of MESSRS. C. A. VANDERVELL & CO., LTD., Acton, London, W.3.

The main feature of the device is an automatic regulator by virtue of which, it is claimed, the charging rate of the battery is regulated in accordance with its condition, and divides the total load between the dynamo and the battery in such proportion as will, under every condition of load, and whatever the state of charge or discharge of the battery, tend to keep it in the best possible condition. It reduces fluctuations

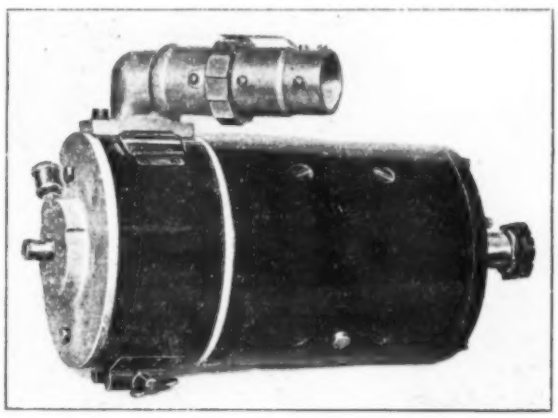


Fig. 4.—Dynamo of Vehicle Lighting Set.

of pressure on the lamps and reduces the cost of maintenance on this item to a minimum.

The dynamo is of robust design, and is fitted with extra large ball bearings. It has an output of 350 W and commences to generate at 480 r.p.m., giving its full output at 900 r.p.m. It weighs 65 lb. and is built to withstand severe vibration.

The brushes can be easily removed for inspection, and being in pairs they can be examined one at a time while the dynamo is under load. A large disconnecting plug fitted to the dynamo simplifies the wiring.

The dynamo is also fitted with a splash and proof device to prevent oil from finding its way inside the machine.

Automatic Temperature Regulation.

The Cambridge System of Automatic Control.

ELECTRICAL methods have revolutionised practice in many processes involving close regulation of the temperature between definite limits, and have, indeed, in some cases revealed the importance of selecting and adhering to such limits; but usually the regulation is effected by manual control, which is always liable to error or negligence, or too tardy to cope with rapid changes in the conditions, and has to be paid for. Serious loss may result from failure to maintain the temperature at the right value.

The obvious remedy is to combine control with indication, and to make the whole automatic. For this purpose the Cambridge Instrument Co., Ltd., has developed and patented a system which has numerous applications, not only in the industries but also in connection with other human activities —for example, in hospitals, hotels, and theatres—and in the latter class it may provide also for the automatic control of the humidity of the atmosphere, thus ensuring as far as possible personal comfort. The range of temperatures at which control can be effected is anywhere between −200 and +1,700 deg. C.

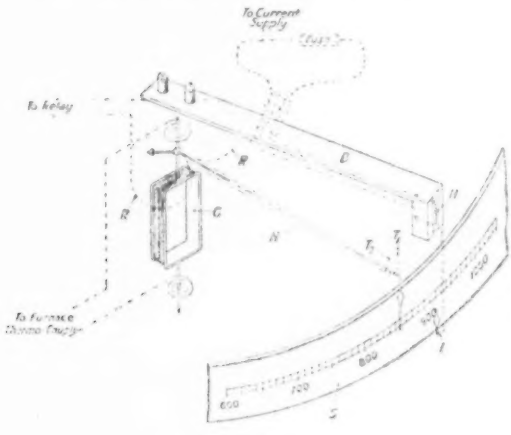


Fig. 1.—Electrical Control Unit.

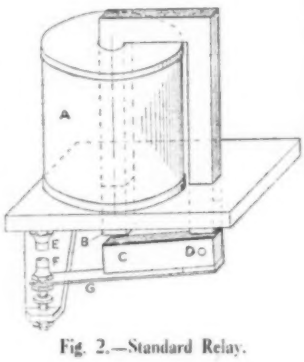


Fig. 2.—Standard Relay.

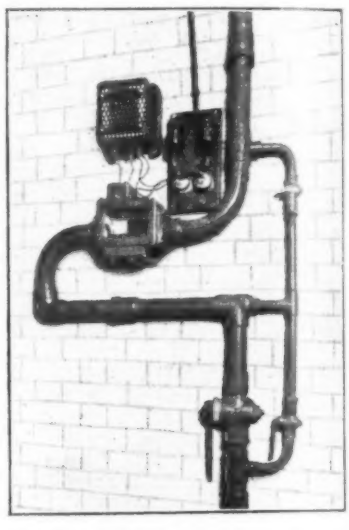


Fig. 3.—Electromagnetic Valve on Gas Pipe.

The control unit consists of a moving-coil galvanometer of the high-resistance millivoltmeter type, with a scale on which the temperature can be read at any time. The movement is illustrated in fig. 1; the pointer N, attached to the pivoted moving coil G, carries at its extremity a differential thermo-couple T_1, T_2, which is connected electrically to a robust moving-coil relay. A small electrically-heated coil H is mounted on a movable arm R, which is set, by means of a removable handle, to the point on the scale at which it is desired to control the temperature, with the aid of an index I. When the desired temperature is approached the thermo-couple T_1 comes close to the heating coil, and an e.m.f. is set up which tends to throw the relay arm *away* from the contact which it will eventually close. As the temperature rises further, the second couple T_2 approaches the heater, and its e.m.f. actuates the relay, which closes an electrical circuit and thus operates mechanism which reduces the supply of heat; as the temperature falls, the thermo-couple T_1 again approaches the heating coil, and its e.m.f. causes the relay to break contact, overcoming any tendency to stick, and thus allows the supply of heat to be increased again. By this differential device considerable energy is provided for operating the relay without the use of any other source of energy.

The scale is uniformly divided, and the heater can be set to control the temperature at any point within its range. A device can also be provided whereby the control temperature is automatically altered by a definite amount at a predetermined time; or the regulator may be used to control temperatures throughout a complete cycle of heating and cooling operations. Should the heater circuit be interrupted, a safety device causes the supply of heat to the process controlled to be cut off, or an alarm may be actuated.

The power taken by the heating coil is about 2 watts, and may be derived from any d.c. or a.c. circuit by suitable means, or from a small accumulator. The type of sensitive element employed in conjunction with the regulator depends upon the purpose to be filled and the temperature desired, and may accordingly be a resistance thermometer or a thermo-couple. With the former a very open scale can be obtained, and it is stated that temperatures up to 800 deg. C. can be controlled to within 0.3 per cent. Above that value, the inaccuracy is generally less than one per cent. of the range for which the instrument is calibrated. For the higher temperatures thermocouples are usually employed, and above 1,250 deg. C. a Féry radiation pyrometer is used. A useful application of the regulator is in connection with automatically-operated sub-stations; in this case thermocouples are embedded in the windings of the machines or transformers, and if the temperature of these rises to a dangerous extent, the regulator shuts down the station until the temperature has fallen to a point at which it is safe to resume operation when the regulator starts the station again.

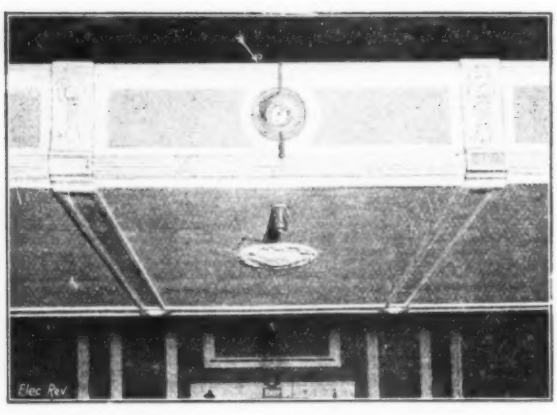


Fig. 4.—Regulator Controlling Temperature of Auditorium.

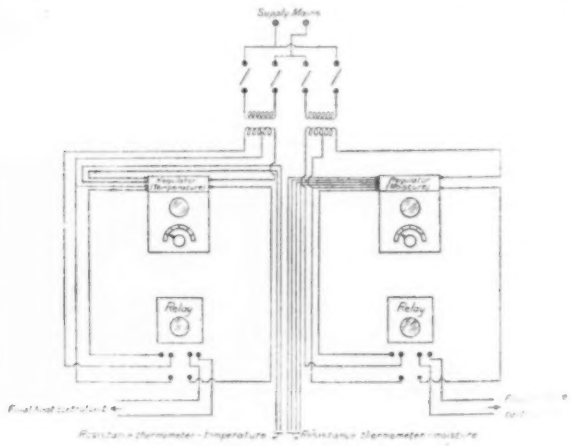


Fig. 5.—Diagram of Connections.

In some applications the regulator can actuate directly suitable valves or circuit-breakers which control the heating supply; but if the power required for this purpose exceeds 10 watts, a relay must be employed. The standard relay associated with the Cambridge system is an electromagnet A, fig. 2, with a laminated core B, suitable for a.c. or d.c., which, in operation, pulls up a pivoted armature CD, and closes the secondary circuit contacts E, F. The contact F is carried on a spring arm G, and meets E before the armature has completed its stroke, ensuring firm contact. Alternatively, the relay may be arranged to open the secondary circuit, normally closed. The power required in the primary circuit is only 0.05 watt, a.c. or d.c.; that in the secondary circuit may be up to 1,000 watts. In another type of relay, for use where very quick control of temperature is necessary, a three-contact device in the form of a mercury switch is used, which, for instance, turns on cold water simultaneously with cutting off the supply of heat, and *vice-versa*.

A common application of the system is to actuate a valve controlling the supply of gas or steam to a heating device; in a balanced valve of this type the gas enters a chamber with outlets covered by two disks on a stem suspended from a lever. At the other end of the lever is an armature operated by an electromagnet, and balanced by a spiral spring. When the electromagnet is energised both apertures are closed by the disks. An actual installation is shown in fig. 3, where the electromagnetic valve is fixed in a by-pass on a gas pipe, the cock in the main being adjusted to give slightly less gas supply than will maintain the desired temperature. This valve may be used for pressures up to 10 lb. per sq. in., and is actuated by one watt at that pressure.

Besides the electrical control instrument described above, the company makes a mechanical type, operated by a mercury-in-steel thermometer fitted with a contact pointer which can be set to the desired temperature reading; when the thermometer pointer reaches this contact, an electrical circuit is closed which operates, directly or by a relay, mechanism controlling the supply of heat, such as an electrically-operated valve or a circuit-breaker. One of these is shown in fig. 4, controlling the temperature of the auditorium in a London kinema, by acting on an electrically-operated gas valve in a by-pass to the main pipe supplying gas to the heating apparatus. The humidity of the atmosphere can be similarly controlled with the aid of two electrical thermometers acting as dry-bulb and wet-bulb respectively, the regulator being correspondingly modified, and controlling apparatus which varies the humidity of the air supply to the room. The connections to effect the double purpose are shown in fig. 5. Humidity control has many other applications, as, for instance, in textile, chemical, and tobacco factories.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Luminous Electric Radiators.

In your note at the foot of my letter published in the ELECTRICAL REVIEW on May 8th, you state that everyone knows that all types of electric heaters convert electrical energy into heat with an efficiency of 100 per cent. This is exactly what I wished to prove, as your former note asked what became of the 96 per cent. of energy not turned into light. I am afraid some of your readers actually inferred that this was loss of energy, and that the heat lamps were inefficient. The only point left between us now to consider is, is it possible to utilise the heat provided by lamp radiators in as efficient a way as the ordinary exposed wire type of heater, and you quote from Dr. Margaret Fishenden's book on "House Heating" to prove that it is not so. I have no knowledge of the source from which this lady has obtained her information (which is not in accordance with my investigations during the last twenty years), but I will quote from another member of the medical profession, Dr. W. S. Hedley, many years in charge of the Electrical Department of the London Hospital, who gave the luminous radiant heat system his very careful study. In a paper read before the British Balneological and Climatological Society on "The Therapeutics of Heat" in 1899, he said:—"Being acquainted with Professor Tyndall's researches, which prove the far greater intensity of heat rays proceeding from a luminous source, I had an apparatus constructed on this principle which I showed before this Society on the occasion I have already referred to. I then explained that according to my view, the attempt to heat the body through the medium of a heated substance, such as air, is not an efficient way of penetrating the tissues, the slowly conducting dry air and the free radiation that it permits enables the living body to keep its interior cool by means of its thermotaxic mechanism. . . . Heat radiation is the propagation through the ether of impulses imparted to it from the molecular motion of a heated body.

Strictly speaking, there is not a transference of heat, but a transference of energy, which becomes heat on encountering an obstacle in its path. Heat and light are each particular cases of what is known as 'radiant energy.' There is no essential physical difference between them, and their laws of propagation are identical. The dark or invisible rays of what is called heat differ from the visible rays of light only in their longer wave length. Reverting to Tyndall's experiments:—On examining the obscure band of the spectrum it can be shown that as the light rays are added the heat becomes more intense, *i.e.*, the heat wave has acquired a greater amplitude. The inference from these facts seems obvious, *viz.*, use luminous heat if it is desired to penetrate the tissues of the body. When placed in the apparatus referred to, midway between two heaters twelve inches apart, the thermometer runs quickly up to 350 deg. F. . . . I consider that the ideal source of heat for such a purpose is a luminous one; with this to start with it is evident that by suitable diffusing arrangements, or screening with metal or coloured media, every form of heat can be contained." The late Dr. Douglas Kerr, the well-known physician of Bath, also stated in a similar paper to the Society:—"The luminous heat rays require no medium at all, but may be radiated directly on the body even through a glass screen or in a vacuum. The air surrounding the bather may be freezing, and yet the radiation from the electric lamp may be propagated and warm the body on which it is impinged. The luminous heat rays are much more intense than the obscure heat rays, though they are both movements or vibrations of ether, and are governed by the same laws. The luminous electric heat rays more closely resemble the sun's rays."

Several other eminent men took part in the discussion, and expressed their views in favour of the luminous electric radiator, and it was this medical testimony that first led me to advocate the use of the electric lamp radiators as being specially suitable for warming the person. The advocates of the "Sunshine Treatment" for children further confirm this view.

I note that Dr. Fishenden states that an electric lamp radiator may emit a radiation of as much as 70 per cent. of the current consumed, but adds that when backed with a copper radiator, this radiation would be reduced! A copper reflector does not stop the emission or radiation from the lamp, it merely reflects the luminous heat rays already emitted and causes them to pass in any particular direction. Radiant heat, like light, can be reflected and focused if need be. It is by using this valuable property that we are enabled to vastly increase the heating effect in any given direction. It is easy to prove the greatly increased volume and intensity of heat rays in any given direction, by placing a carbon lamp in a good lamp reflector, and measuring the increased temperature shown on a sun (blackened bulb) thermometer. In my early experience I actually melted scores of lamps until I discovered it was the reflected heat that caused the back of the lamp to become overheated and the glass to give way. In my first patent I devised a means for obviating this by making the inside of the reflectors conical or V shaped, so that the reflected heat would be spread, and not all received on the lamp. This was when we used round lamps of about 250 watts capacity. The trouble disappeared with the long heat lamps. If Dr. Fishenden or any other person interested cares to carry out an experiment to confirm, or otherwise, this statement, I should be pleased to afford them every facility for doing so, by placing lamps, reflectors, and assistance at their disposal. I am satisfied that approximately 70 to 75 per cent. of the luminous heat produced is given off by radiation and the remaining 25 per cent. by the glass of the lamp and the reflectors by convection.

May I add that at the Crystal Palace Exhibition in 1891, I demonstrated for the first time in this country electric heaters which were all of the non-luminous type, and from that date to the present time I have made electric wire radiators of all types; the luminous type of radiator, which I introduced for a special purpose, is preferable to others where radiant heat is desired. It may be noted that gas companies have in recent years pointed out the advantages of heating by radiation in preference to air heating by convection currents. There may be a reason for this on the part of the companies referred to, but that does not detract from the value of the "sunshine" system of heating. Some years ago I made electric reflectors with luminous heat lamps attached, for fixing in the ceiling, from which light and heat rays were dispersed all over the room as from sunshine. This was the best and most perfect substitute for natural sunshine that I ever experienced, but I was up against the electric supply companies, who insisted on charging at the lighting rate for both the light and heat produced, which made the use of these radiators impossible. When we get a low uniform rate for electricity, we may see this system of heating revived.

H. J. Dowsing.

London, *May 23rd*, 1925.

[Dr. Hedley's remarks of 25 years ago relate to the therapeutic value of luminous radiation; they have no bearing on the question under discussion, which is the relative efficiency *as radiators* of the two types of electric heaters.—EDS. ELEC. REV.]

Radio Communication.

The following is an extract from an article by Mr. E. F. W. Alexanderson in the April issue of the *General Electric Review*: "The modern commonwealth of the Atlantic Ocean has been held together by the telegraph cable system centred in London. The scene is now shifting and New York is becoming the finan-

cial and commercial centre of the world. New York has now a well-developed new system of communication reaching all parts of the world by radio.

Trade is surely not so very flourishing in this country that we can afford to dispense with new aids to efficiency used by our competitors!

Why is London not *now*, and when, if ever, will it be, in touch with the whole world by wireless?

How can we expect progress while the ultimate control of this system is vested in a Government Department which has little real faith in its commercial possibilities, a Department which has shown itself incapable of providing an efficient and paying service itself and, moreover, seems to obstruct private enterprise in that direction?

A few well-known business men seem to be realising this at last, but how long will it take the general public to do so?

R. F. Damsell.

Rugby, *May 21st*, 1925.

P.S.—I imagine the Press is becoming "fed up" with the subject of wireless and the G.P.O., but how *can* one cause a Government Department to really *shift*!

Aeroplane Crashes and Ignition Circuits.

All condensers and insulations of primary windings of ignition systems should, in my opinion, be capable of standing 400 volts r.m.s., a.c., at commercial frequency; this, in the condenser case, for a period of one or two minutes under ordinary atmospheric conditions. This means a maximum p.d. of 565 volts, and in condensers for battery ignition, such as are *now* used by my company, with paper dielectrics, in which the damping action due to dielectric hysteresis loss is thought to be helpful to the life of the platinum points, this would no doubt be somewhat more severe than 400 volts d.c.

I cannot advance any explanation of the nature which Mr. Booth seems to demand of "the many failures of magnetos," being of the opinion that we cannot think of any failures as belonging to a category apart from inferior construction.

The general use of the auto-transformer method of connection is not mainly on account of the extra one or two per cent. (with which figures I am in agreement), that small amount being almost immaterial; but it is a result of greater convenience and economy constructionally. To start the secondary winding at the finish of the primary, rather than at the beginning of the primary, involves less total insulation.

On the subject of ignition failures generally, a small paragraph, entitled "Automobile Ignition Failures," appearing on p. 785 of your issue of May 15th, will be of interest to those who follow this correspondence.

E. Fowler Clark, A.M.I.E.E.

Derby, *May 22nd*, 1925.

Wiring Systems and Wireless Telephony.

Quite a lot has been said during the past few years about the relative merits of metal-sheathed wiring systems and those in which the rubber insulation is not protected with a metal sheath. It seems, however, that the introduction of wireless sets into our homes raises a new point.

In houses wired for electric light and heating on a.c. systems, it is quite possible for the broadcast receiving to be marred by a humming noise in the head 'phones, due to induction from the wiring. With crystal sets and a 50-cycle supply this may be so loud in comparison with the broadcast signals as to be irritating to the listener, while on a 100-cycle supply it becomes a recognised nuisance.

On the face of it one would expect the metal-sheathed wiring systems to have considerable advantage in this respect over those not so protected, but to obtain definite data on the point a simple experiment has been carried out in these laboratories, the results of which may interest your readers.

About 50 yards each of Henley wiring system twin cable and a similar length of twin insulated cable not metal sheathed were disposed about the laboratory and connected to the two sides of a 2-way switch which enabled one or the other to be connected to a 250-volt 50-cycle supply.

The head 'phones of a crystal set placed within a few feet of the cables gave perfect silence with the Henley cable connected, but a perceptible hum with the unprotected rubber. On connecting a 3-valve amplifier and loud speaker to the output of the crystal set, the induction from the rubber-covered cable developed into a loud note which would spoil any broadcast programme, while, when we switched over to the Henley wiring, only the faintest note could be detected, and this was evidently due to other wiring about the laboratory, probably lamp flexibles, as it was present whether the switch was open or closed.

It is evident then that in order to avoid interference with wireless receiving sets a metal-covered house wiring system has considerable advantages over the unprotected rubber-covered wire.

P. Dunsheath.

Research Laboratories,
W. T. Henley's Telegraph Works Co., Ltd.
May 21st, 1925.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

27,736. "Method or apparatus for measuring electricity." H. Cooch. November 5th, 1923. (232,999.)

31,897. "Protection of electrical apparatus from inflammable surroundings." J. S. Pringle and A. E. Frankling. September 9th, 1924. (233,003.)

1924.

14. "Electrical terminals specially applicable for wireless receiver terminals." W. Sumner. October 1st, 1924. (233,006.)

73. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and J. E. Ostline. January 1st, 1924. (Cognate applications, 6,610/24 and 12,136/24.) (233,007.)

139. "Telephone receivers and like instruments, particularly for use in wireless receiving apparatus." C. H. Hood. January 3rd, 1924. (233,008.)

2,092. "Crank transmission mechanism for use on electrically-propelled vehicles." Sir P. Dawson and Dr. E. Seefehlner. January 25th, 1924. (233,017.)

2,121. "Rotary drum illuminated signs." W. J. Beville. January 26th, 1924. (233,022.)

2,140. "Means for receiving radio signals." G. M. Wright. January 26th, 1924. (233,024.)

2,500. "Generation of waves for wireless telegraphy and telephony by thermionic valves." C. Seymour, H. Morris-Airey, G. Shearing, and C. Matthews. January 30th, 1924. (233,037.)

2,665. "Thermionic valves and the like." W. R. Bullimore. February 1st, 1924. (233,045.)

2,765. "Inductances for high-frequency electric currents." Fuller's United Electric Works, Ltd., and A. P. Welch. February 2nd, 1924. (233,050.)

2,780. "Systems of electric ship propulsion." British Thomson-Houston Co., Ltd., and D. E. Jewitt. February 2nd, 1924. (233,051.)

2,802. "Methods of preventing self-oscillation of the valve circuits in electron relays and in transformers therefor." W. Rawsthorne. February 4th, 1924. (233,053.)

3,849. "Electromagnetic mechanism for railway signalling and the like." W. S. Roberts and Railway Signal Co., Ltd. February 14th, 1924. (233,070.)

6,041. "Electric switches." A. B. Mudie. March 10th, 1924. (233,094.)

6,274. "Reflectors for electric, gas, oil, and the like stoves or radiators." H. H. Berry. March 11th, 1924. (233,095.)

7,765. "Accumulator cases." P. D. Foley and Greenhill & Sons, Ltd. March 27th, 1924. (233,104.)

8,675. "Railway and tramway points or switches." S. S. Wrightson and C. R. Matthews. April 7th, 1924. (233,110.)

9,054. "Electric couplings for earth connections." W. J. Davis and Edison Swan Electric Co., Ltd. April 9th, 1924. (233,116.)

9,225. "Wireless receiving apparatus." E. A. Burton. April 11th, 1924. (233,118.)

9,512. "Doors or closure members for terminal boxes such as are used for high-tension electrical equipment." S. Wheeler, Ltd., A. H. Wheeler, and J. H. Castell. April 15th, 1924. (233,120.)

9,643. "Means of and apparatus for transmitting messages through submarine and other like cables." W. Estaugh. April 16th, 1924. (233,124.)

12,034. "Impulse-repeating arrangements for telephone systems." Automatic Telephone Manufacturing Co., Ltd., and H. Adams (Automatic Electric Co.). May 15th, 1924. (233,146.)

12,073. "Illuminated sign." A. Johnson. May 16th, 1924. (233,147.)

12,312. "Connecting rods for railway or tramway points or switches." S. S. Wrightson. May 20th, 1924. (233,151.)

12,480. "Device for carrying wireless valves and other goods of a fragile nature." M. Wade-Astley. December 13th, 1924. (233,152.)

12,660. "Wireless plug-in coil." T. A. Auty and B. A. Mahomet. May 23rd, 1924. (233,157.)

12,790. "Electric tube-welding machines." E. Schroder. May 24th, 1924. (233,159.)

12,917. "Process of electro-plating." E. M. Baker. May 26th, 1924. (233,161.)

13,332. "Electrical condensers." E. T. Cook. May 30th, 1924. (233,163.)

14,260. "Magneto-electric machines for velocipede lighting." Quast & Co. June 13th, 1923. (217,597.)

15,269. "Electrical regulating apparatus." Soc. Alsacienne de Constructions Mecaniques and L. Wasser. June 24th, 1924. (233,185.)

15,844. "Dynamo-electric generators." A. C. Lock and V. J. S. Russell. July 1st, 1924. (233,192.)

16,383. "Spare electric incandescent lampholders for vehicles." British Thomson-Houston Co., Ltd. July 9th, 1923. (219,005.)

16,852. "Car headlight anti-dazzle devices." J. F. Wilson. July 14th, 1924. (233,198.)

20,363. "Variometers for use in wireless installations." H. F. Bowers and E. V. Bowers. August 28th, 1924. (233,213.)

22,667. "Electrical connectors." M. U. Caillau. September 27th, 1923. (222,480.)

24,895. "Lamp bulbs for vehicle headlights and the like." L. G. Williams. October 18th, 1924. (Addition to 203,471.) (233,238.)

25,448. "Electricity meters." Siemens Schuckertwerke-Ges. October 27th, 1923. (223,931.)

28,963. "Sparking plugs for internal-combustion engines." Soc. J. De Saint-Martin et Chabrolle. December 3rd, 1923. (Addition to 217,808.) (225,851.)

1925.

3,171. "Highway lighting." Benjamin Electric, Ltd. May 15th, 1924. (233,282.)

4,184. "Electrical condensers." W. Dubilier. February 14th, 1924. (Divided application on 229,239.) (229,338.)

6,652. "Circuit arrangements for automatic selectors used in telephone systems." Siemens Bros. & Co., Ltd., and W. G. Patterson. September 15th, 1924. (Divided application on 230,521.) (233,288.)

The Abrams Treatment.—The Auckland correspondent of the *Daily Mail* reports that on a motion of the New Zealand Medical Board, Mr. Justice Herdman recently ordered the name of Henry Dundas Mackenzie to be struck off the Medical Register of New Zealand on the ground that he had been guilty of infamous conduct in a professional respect. It was alleged that Dr. Mackenzie had for the past four years practised the method of diagnosis and treatment known as Abrams (Abrams "Magic Box"), in such a manner as to show that he could not honestly have believed that it was reliable or useful in the cases in which he employed it. Dr. Mackenzie will appeal.